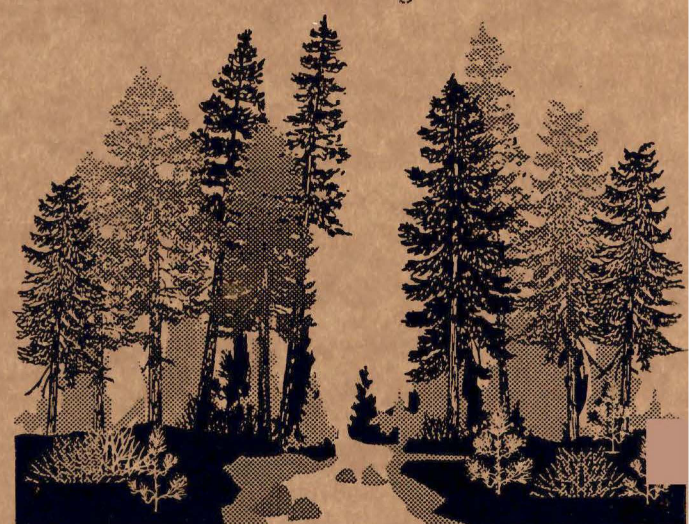
EIS
Douglas-fir
1999

Volume II

Region 1 Region 6

Douglas-fir *Beetle* *Project*

Regenerated Forest



Aquatic Restoration

Fuels Reduction

FINAL
Environmental Impact Statement

for the
Idaho Panhandle
National Forests
and
Colville National Forest

1999

FINAL ENVIRONMENTAL IMPACT STATEMENT
DOUGLAS-FIR BEETLE PROJECT

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* Appendices B and C are bound separately and are available upon request from the IPNF and Colville National Forests Supervisor's Offices, at the addresses below.

Larger scale maps are contained in the Project Files and are also available upon request.

Copies of this Final EIS are available on compact disc (CD) from the Idaho Panhandle and Colville National Forests Supervisor's Offices, and on the Idaho Panhandle National Forests' internet site at www.fs.fed.us/ipnf/dfbugs.

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VEGETATION

CHANGES BETWEEN THE DRAFT AND FINAL EIS

In response to comments and recognition of errors in the Draft EIS, the Final EIS has changes in the vegetation section. A brief summary of the changes are as follows: The characterization of the Priest Lake project area has been expanded to better describe the habitat type groups. A more lengthy description of moist and dry site old growth has been included. Minor changes have taken place in the analysis numbers in most alternatives. Many wording and other editing changes have taken place to further clarify the descriptions of information provided. Alternatives F and G have been added and analyzed in response to comments. There is expansion on the description of cumulative effects and foreseeable actions.

REGULATORY FRAMEWORK

Regulatory constraints applying to the management of timber resources include the State Forest Practices Acts, Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), National Forest Management Act of 1976 (NFMA), Idaho Panhandle National Forests Forest Plan (USDA 1987) and Forest Service policy.

- *RPA states, "It is the policy of Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans."*

- *The 1976 National Forest Management Act directs that Forest Plans will be developed which specify guidelines to identify the suitability of lands for resource management; provide for the diversity of plant and animal communities based on the suitability and capability of land areas to meet multiple-use objectives; where appropriate, to the degree practicable, preserve the diversity of tree species similar to that existing in the planning area; insure that timber will be harvested from National Forest System Lands only where soil, slope, or other watershed conditions will not be irreversibly damaged; the lands can be adequately restocked within five years after harvest; protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water where harvests are likely to seriously and adversely affect water conditions and fish habitat; and the harvesting system used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber.*

- *Any cut designed to regenerate an even-aged stand of timber must be determined to be appropriate to meet the objectives and requirements of the land management plan and, in the case of clearcutting, is the optimum method; has had an interdisciplinary review of impacts and the cuts are consistent with the multiple use of the general area; will be shaped and blended, to the extent practicable, with the natural terrain; meets established, suitable size limits; and is carried out in a manner consistent with protection of soil, watershed, fish, wildlife, recreation, esthetic resources, and the regeneration of the timber resource.*

- *NFMA amended RPA and requires that stands of trees shall generally have reached the culmination of mean annual increment of growth prior to harvest, but this does not preclude the use of sound silvicultural systems such as thinning and other stand improvement measures; it also allows salvage or sanitation harvest following fire, windthrow, or other catastrophe or within stands in imminent danger of insect and disease attack.*

Forest Service policy directs land managers to:

- *Use only those silvicultural practices that are best suited to the land management objectives for the area. Consider all resources, as directed in the appropriate forest plan.*
- *Prescribe treatments that are practical in terms of cost of preparation, administration, transportation systems, and logging methods.*
- *Monitor practices, using procedures specified in forest plans to ensure objectives are met.*
- *Before scheduling stands for regeneration harvest, ensure, based on literature, research, or local experience, that stands to be managed for timber production can be adequately restocked within five years of final harvest. Five years after final harvest means five years after clearcutting, final overstory removal in shelterwood cutting, the seed tree removal cut in seed tree cutting or after selection cutting.*
- *Perform all silvicultural activities in the most cost effective manner consistent with resource management objectives.*

Forest Service policy further directs that:

- *The size of tree openings created by even-aged silvicultural methods will normally be 40 acres or less. With some exceptions, creation of larger openings will require 60-day public review and Regional Forester approval.*
- *For management purposes, cut areas created by even-aged management will no longer be considered openings when both vegetation and watershed conditions meet management objectives established for the management area.*
- *Management activities will promote programs that provide a sustained yield of forest products consistent with the multiple-use goals established in Regional Guides and the Forest Plan.*
- *Timber management activities will be the primary process used to minimize the hazards of insects and diseases and will be accomplished primarily by maintaining stand vigor and diversity of plant communities and tree species.*
- *Protection of timber stands from insect and disease problems will center around the silvicultural treatments prescribed for timber management activities.*
- *Proposed activities will be consistent with Management Area objectives. Descriptions and objectives of these Management Areas are included in the Forest Plan.*

AFFECTED ENVIRONMENT

Introduction

The vegetation in northern Idaho is a result of the prevailing climatic pattern in which westerly winds carry maritime air masses from the northern Pacific across the northern Rocky Mountains. The inland maritime air flow provides northern Idaho with abundant moisture and moderate temperatures (see Disturbance and Successional Patterns - Weather below).

The subbasins of north Idaho support a diversity of habitats, many of which harbor plant species known or thought to be rare. Approximately ten percent of the estimated 1,200 to 1,500 plant species known or suspected to occur in the analysis area are considered to be rare or uncommon. Of the 63 plant species listed as sensitive

on the IPNF, 48 are known or suspected to occur in the Priest Lake subbasin. Two threatened species are suspected to occur, but have never been documented in the subbasin.

Habitat Types

The designation of habitat types and classification of forest stands was established to characterize vegetation based on potential climax conditions. Climax conditions represent the culmination of overstory and understory plant succession without disturbance. Because climax species, by definition, are those species that are self-perpetuating in the absence of disturbance, and because natural disturbances are relatively common on most sites, the occurrence of climax conditions historically was rare (Cooper et al. 1987).

The forest type of a stand is the existing dominant vegetation. Because of the relative rarity of climax conditions, designated forest types were historically not the shade-tolerant climax species, but the more shade-intolerant seral species. Substantial changes have occurred in historic forest types; these changes are discussed below.

Successional studies and habitat type characterizations address conifer-dominated overstories and shrub, forb and grassy understories. However, other vegetation types of importance are currently poorly classified in north Idaho, particularly hardwood-dominated riparian, aquatic, peatland and subalpine grassland habitats. Characterization of these other vegetation types has occurred mostly in relation to watershed and rare plant classifications.

Threatened and sensitive plants and Forest species of concern can be assigned to one or more rare plant guilds. These guilds are artificial assemblages of habitats based on similar habitat requirements of two or more rare plant species, and are used for analysis. For the Idaho Panhandle National Forests, the rare plant guilds include aquatic, deciduous riparian, peatland, cold forest, wet forest, moist forest, dry forest and subalpine habitats. A detailed description of these habitat guilds is in Appendix B. Threatened and sensitive plants are discussed later in Chapter III.

Habitat Type Groups

Information on habitat groups is derived from Fire Ecology of the Forest Habitat Types of Northern Idaho (Smith and Fischer 1997) and Biophysical Classification - Habitat Groups and Descriptions (R-1 Landscape Ecology Peer Group, July 1997).

Although every habitat type is unique in some way, they can be grouped based on similarities in natural disturbance regimes, successional patterns, and structural characteristics of mature stands (Region One, USDA Forest Service 1996). In an effort to categorize vegetation responses to disturbance (primarily fires), habitat types have been aggregated into four groups - dry, moist, moderate subalpine and upper subalpine. The majority of beetle-affected areas and those at high risk for beetle infestation are in the dry and moist habitat groups.

Dry Habitat Type Group - Forest types in this group consist primarily of Douglas-fir, ponderosa pine and western larch. This habitat group represents 14 percent of the total beetle activity and high hazard areas.

Because of many comments concerning proposed treatments in dry site old growth forests, an expanded description of their structure, species composition and natural disturbance mechanisms is provided below. Natural disturbance maintained these site with frequent low intensity fire; proposals to manage these sites would reintroduce fire following reduction of fuels that have accumulated from many years of fire suppression.

<u>Dry Forest Old Growth</u> - Douglas-fir and ponderosa pine old growth in the Priest Lake subbasin historically occurred in very dry to moderately dry habitat types. Very dry sites were dominated by large, old ponderosa

pine or Douglas-fir, with canopy cover often less than 30 percent and seldom reaching 50 percent. Grasses and low shrubs dominated the understory and were maintained by low-severity fires at intervals of 15-20 years. Downed woody fuels consisted of widely scattered, large trees, twigs, branches and cones; often the most abundant surface fuel was cured grass. Before the 20th century, these sites were characterized by frequent underburns that eliminated most tree regeneration, thinned young stands, and perpetuated open stands dominated mainly by ponderosa pine. Occurrence of this type of old growth in extreme north Idaho has been limited, due in large part to a moderate moisture regime atypical of most of the interior west.

The more common moderately dry old-growth forests are also open-canopied, although canopy cover often exceeds 50 percent. Ponderosa pine and Douglas-fir dominate the overstory, with western larch as a co-dominant on moister sites. The species composition and structure of moderately dry forests is dependent largely on the frequency and severity of fires. Drier forests within this group typically experienced succession dominated by ponderosa pine and Douglas-fir. Historically, low-severity fires at intervals of less than 50 years maintained a high, open canopy in these stands and perpetuated dominance by ponderosa pine. Very long fire-free intervals have in many cases produced mature stands with few ponderosa pines or western larch. While large Douglas-fir can survive low-intensity fires, the dense understory and ladder fuels resulting from absence of fire increase the potential for lethal, or stand-replacing fires. Moister forest within this group historically burned frequently enough to maintain a structure dominated by ponderosa pine and larch. Where fire has been excluded for a very long time, ponderosa pine and larch have gradually declined, with Douglas-fir persisting in the overstory.

Ponderosa pine, Douglas-fir and western larch old growth stands are usually single-storied and open-canopied and have a low to moderate likelihood of occurrence of large down wood (Green et al. 1992). Old growth of this type historically was maintained by frequent, low-intensity disturbance. Several beetle-affected dry forest old-growth stands are proposed for treatment under some alternatives which would promote or enhance old growth characteristics by reducing the occurrence of Douglas-fir and grand fir and re-introducing low levels of disturbance.

Moist Habitat Type Group - These forest types consist primarily of western redcedar, western hemlock, western larch, grand fir, western white pine and lodgepole pine; they account for 86 percent of the beetle-affected and high hazard areas. These are the most common forest types found on mid-elevation sites in the mountains of north Idaho. Prior to the introduction of blister rust, when white pine was a dominant species, with over 40% of these areas dominated by white pine, the area was known as the "white pine type." Today, only four percent of the entire Priest River subbasin is classified as a western white pine forest type.

<u>Moist Forest Old Growth</u> - Moist old growth western redcedar and western hemlock, in contrast to dry old growth forests, often are multi-storied, closed-canopied and have a high likelihood of abundant large, down woody material in various stages of decay (Green et al. 1992). Historically, much of the area's moist site old growth was dominated by seral white pine or western larch cover types. This type of old growth is generally maintained by infrequent, often patchy disturbance (such as from lightning strikes and scattered burns or windthrow). Historically, mixed-severity fires occurred at 50-150 year intervals. Douglas-fir beetle activity in moist forest old growth within the project area was scattered. No currently designated or potential moist forest old growth is proposed for harvest treatment under any alternative.

Ecosystem Setting

Columbia River Basin

Based on recent findings presented in the Interior Columbia Basin Ecosystem Management Project (ICBEMP), disturbances such as those related to fire and insect mortality have played an important role in determining forest composition throughout the Interior Columbia Basin. Within northern Idaho and eastern Washington, the most significant historic natural disturbance was fire. In addition to natural disturbance, the Assessment

found that land management activities and introduced pathogens have dramatically altered the species and age composition of vegetation resulting from a natural disturbance regime.

The vegetation composition was historically dominated by species such as ponderosa pine, western larch and western white pine. These long-lived tree species were typically established after some form of disturbance and have the potential to occupy a site for 200-300 years. Many of the local disturbance regimes not only initiated these long-lived species, but also maintained them in mature conditions. Stands of these trees were adapted to regenerate and survive local fire regimes. Historic levels of insect populations, along with wind and winter storm damage, contributed to stand mortality and over time created conditions for large stand-replacing fires.

With the loss of much of the white pine due to the introduced blister rust pathogen, effective reduction in wildfires, and land management activities such as logging, the character of the forest has changed. The forests are now dominated by shade-tolerant grand fir and western hemlock and by Douglas-fir. These species are more vulnerable to disturbances such as insects, diseases and fires. They are less fire- and drought-adapted and less adapted to natural climatic variability than the species they replaced. The results are more insect and disease problems and higher fire risk. The magnitude of the Douglas-fir beetle outbreak is related primarily to the damage caused during the 1996-97 winter storms; the dry, hot summer experienced in 1998; and the increase in abundance of Douglas-fir.

Northern Region Assessment

The Northern Region Assessment (USDA 1999) focused on priorities for restoring ecosystem health and availability of recreation opportunities. The assessment describes the changes in vegetation that are contributing to the current beetle infestation. "In northern Idaho and moist portions of western Montana, Douglas-fir was largely an early succession species that regenerated well after wildfire in various mixes with white pine and larch, but then was largely eliminated by root diseases and bark beetles after 100-140 years, giving way to pine and larch. In the absence of white pine and larch, we have experienced an increase in Douglas-fir during early succession, and an apparent increase in root disease inoculum levels as succession proceeds. When Douglas-fir dies in stands now, the result is an effective 50-150 year acceleration of succession to grand fir and hemlock. This condition with heavy root disease and ladder fuels promotes and increases risk of stand-replacement fire." The Northern Region Assessment further states, "The most significant societal and ecological risk is associated with fire; particularly where ladder fuels exist or are developing near or adjacent to urban interface locations."

The assessment considered and incorporates findings from the Interior Columbia River Basin Assessment and Northern Great Plains assessments. The Northern Region Assessment is also consistent with the findings of the Geographic Assessments completed for the IPNFs, as discussed below.

Priest River Subbasin Geographic Assessment

Because of the local variation in landscape change throughout the Columbia Basin, the IPNFs are in the process of completing a Geographic Assessment for the North (Kaniksu) Zone. This Geographic Assessment is following a similar process used in the assessments for the Central (Coeur d'Alene) and South (St. Joe) Zones of the IPNFs. The data for this assessment compare historic and current ecological, social and economic conditions of the Priest River subbasin. Those comparisons were used to characterize the analysis areas infested by or at risk from infestation by Douglas-fir beetles.

Findings of the Geographic Assessment and the Ecosystem Analysis, at least in relation to vegetation disturbance, are very similar to more broad-scale conclusions found at the Columbia Basin and Northern Region scales. In summary, these findings are as follows:

- *Disturbance and successional regimes have been altered since the Euro-settlement in North Idaho.*

- *There has been a substantial reduction in the percent of the landscape composed of early seral tree species such as western white pine, ponderosa pine, larch and whitebark pine. This is primarily the result of fire suppression, timber harvest and the introduction of white pine blister rust.*

- *There has been a major shift in forest structure from old growth (seral species and riparian western redcedar) to medium/immature and large/mature size-class stands. This is primarily the result of timber harvest, suppression of fire and introduction of blister rust.*

- *Landscape patterns have been modified by timber harvest and the exclusion of fire. Current landscape patterns are more uniform. Old growth patches are smaller in size. Approximately the same percentage of the landscape is in openings but the openings are more numerous, smaller in size, and scattered across the watersheds.*

The purpose of the Geographic Assessment is to develop a scientifically-based understanding of the processes and interactions occurring in the analysis area, so that activities can be developed to promote healthy ecosystems. In order to maintain healthy, sustainable ecosystems, it is imperative to use adapted species and adaptable forest structures. This is consistent with the findings of the ICBEMP, Northern Region Assessment and the Geographical Assessments recently conducted in northern Idaho. Findings within these assessments suggest converting shade tolerant/drought and fire intolerant species to shade intolerant/drought and fire tolerant (seral) species through regeneration harvests, reducing fire risk through harvest of overstocked stands, and making use of natural tree mortality. Major concentrations of natural disturbances (insects, pathogens, weather events, fire) will be used as opportunities for restoration. Treatments in response to natural disturbances will trend the ecosystem toward desirable conditions, and will not accelerate undesirable trends.

Findings of the ICBEMP and the Geographic Assessment (in progress) also indicate that there is an increased risk of stand-replacement fires on dry habitat type groups due to fuel accumulations from fire exclusion. Most of the fuels are in the form of green trees within overstocked stands, where dense crowns can now support crown fires. This green undergrowth provides fuel ladders and increases in crown bulk density, both of which increase the risk of crown fire.

With the North Zone Geographical Assessment for the Priest Lake, Bonners Ferry and Sandpoint Ranger Districts still in progress, several historic reference conditions and disturbance/successional influences are used in this chapter. Tables, graphs, and characterizations that have been assembled during this analysis are referenced as (IPNF 1998).

Characterization

Disturbance and Successional Patterns

Native American Influences

Prior to European settlement in the Priest River subbasin, fire was the most influential disturbance on the landscape. It is probable that Native Americans (primarily in the Rathdrum prairie and lower major river valleys) used fire to clear camp and travel areas and create better forage for horses and wildlife. These fires were frequently set and commonly resulted in low-intensity fires that covered large areas. At higher elevations, topography, fuel moisture and fuel types would influence mixed-severity fire with some creeping

underburns and some crowning that would kill small groups of trees. In dry years, fires likely caused mortality over extensive areas.

In the dense forested environments that were more distant from Native American settlements, fires that were a result of lightning were likely most influential in determining vegetation patterns across the landscape. Lightning is a common occurrence in the subbasin. Prior to organized fire suppression, lightning fires burned in a variable pattern, depending on weather conditions. In "normal" years, fires may have reached one to 1,000 acres in size prior to changing weather conditions. These fires burned in a mixed-severity manner, creeping on the ground and jumping into the crowns of dense clumps of trees. During dry years, in combination with a wind event, fires covered large areas, sometimes in the hundreds of thousands of acres. These fires often killed most trees and ground vegetation within the fire perimeter, leaving islands of trees and widely scattered trees in moist areas or where recent low-intensity fires had removed ladder fuel leading to the upper crowns. This mixture of moderately frequent, mixed-severity fires and infrequent high-intensity fires created a landscape of large blocks of old and mature forest with smaller areas of variable younger age classes. It also resulted in large blocks of younger forests with smaller areas of mature and old age classes.

Euro-Settlement Influence

The recent Euro-settlement of northern Idaho and northeastern Washington since the latter part of the 1800s has also influenced changes to forest vegetation. In addition to the previously discussed effects of fire suppression and introduction of blister rust, agricultural land clearing and logging have influenced the composition and structure of forest vegetation. The more economically valuable ponderosa pine was often removed (high-graded) from the drier portions of the lower Priest River subbasin and Pend Oreille analysis area during the earlier days of logging. The more shade tolerant Douglas-fir and grand fir were left to dominate. Unless these areas burned during slash reduction operations or by wildfire, ponderosa pine was unable to naturally regenerate. Tree planting was only initiated on areas that were severely devoid of trees due to logging or fires. Stands with Douglas-fir understories were not planted. On moist sites, western white pine and western larch were removed (high-graded) for their value in the early days. With blister rust spreading at an alarming rate, western white pine was quickly salvaged in order to capture value. Stands of Douglas-fir, grand fir and western hemlock resulted.

Root Diseases

Root diseases are natural agents whose ecosystem role has been changed because of human-caused changes in the ecosystem. Currently, with the loss of ponderosa pine, western white pine and western larch due to fire suppression, past timber harvests and blister rust, these species are not available to re-establish when root diseases remove Douglas-fir. Instead, younger Douglas-fir and grand fir regenerate, leading to cycles of increasing disease severity and declining productivity. Increased Douglas-fir with persistent root disease also influences higher epidemic levels of Douglas-fir beetle that are available to respond to climatic disturbance.

Blister Rust

The introduction of blister rust in the early part of the 1900s and widespread infection of white pines has resulted in a major change to the forest landscape patterns in the Priest subbasin. The significant white pine mortality, salvage logging of white pine, and wildfire suppression has increased the proportion of Douglas-fir, grand fir and western hemlock on the landscape.

Weather

The weather in the Priest River subbasin is very unique to the inland area of the western U.S. Strong maritime air flow carries high levels of moisture to this area. Moist maritime air that moves across the Northwest carries significant moisture descending from the Cascade Mountains and across the Columbia Plateau. When this warm/moist air is driven into the Selkirk Mountains, heavy/wet snows can occur and

are common in the Priest River basin. These storms often result in significant windthrow and breakage in species of trees such as Douglas-fir, western hemlock and grand fir, especially when the ground is not frozen. The narrower crowns of western white pine, the deep rooting habits of ponderosa pine and the deciduous nature of western larch make them less susceptible to this damage. Root diseases make Douglas-fir especially vulnerable to windthrow events.

Douglas-fir Beetle

The Douglas-fir beetle (*Dendroctonus pseudotsugae*) infests and kills Douglas-fir throughout most of its range in the western United States, British Columbia and Mexico. At low or endemic levels, the beetle infests scattered trees, including windfalls; trees injured by fire scorch, defoliation or root disease; or those in a weakened condition due to drought. Where such susceptible trees are abundant, once they have been infested and killed, beetle populations can build up rapidly and spread to adjacent green, standing trees (Schmitz and Gibson 1996). Susceptibility is greatest in stands where the basal area per acre is greater than 120 square feet, Douglas-fir species composition is greater than 30%, Douglas-fir diameters (dbh) are greater than 14 inches, and the stand is more than 120 years old.

One of the earliest recorded Douglas-fir beetle outbreaks in northern Idaho was during the period of 1950-52 (Timber Industry, Bureau of Entomology and Plant Quarantine, Morse et. al., 1953). It is likely that recorded heavy snows in the winter of 1948-49 resulted in significant blowdown and breakage. This event most likely triggered the Douglas-fir beetle outbreak. On the Coeur d'Alene, Kaniksu, and St. Joe National Forests, an estimated 338,600 acres were infested and 139 million board feet were killed. During this outbreak, losses of up to 80% of the mature Douglas-fir component occurred in some stands.

On the Clearwater National Forest from 1970-74, an outbreak occurred after Douglas-fir beetles reproduced in trees felled during the clearing for Dworshak Reservoir and in snow-broken Douglas-fir surrounding the reservoir (Furniss, McGregor, Foiles and Partridge 1979). An estimated 288,000 acres were infested and 111 million board feet of sawtimber recorded as salvageable.

Another outbreak on the IPNFs occurred from 1987-1990 when 31,900 acres were infested and 38 million board feet were killed (Kegley 1998).

Recent endemic Douglas-fir beetle distribution and infestation levels in the subbasin have been high. Dry years have been frequent in the last decade; Douglas-fir root disease has also expanded. Due to high levels of Douglas-fir encroachment from the exclusion of wildfire, high-value species logging, and blister rust introduction, recent beetle outbreaks have the potential to expand to a level outside the beetle's range of natural variation (IPNF 1998).

Fire

Fire is the major disturbance event that produces vegetation changes in north Idaho ecosystems. Fire has burned in every ecosystem and virtually every square meter of the coniferous forests of northern Idaho and eastern Washington. Fire was the principle agent for the widespread occurrence and even existence of western larch, lodgepole pine, western white pine and whitebark pine. Fire maintains ponderosa pine throughout its range at the lower elevations and kills ever-invading Douglas-fir and grand fir (Smith and Fischer 1997).

Recent findings presented in *An Assessment of the Ecosystem Components in the Interior Columbia Basin* (Quigley and Arbelbide 1997) indicate that disturbance such as those related to fire and insect mortality have played an important role in determining forest composition throughout the Interior Columbia Basin. In addition to natural disturbance, the Assessment describes that land management activities and introduced pathogens have dramatically altered the species and age composition of vegetation resulting from a natural disturbance regime.

Northern Idaho, northeastern Washington and western Montana are an island of moisture in the dry interior west. Their forests are very productive and produce high levels of organic material. Because these areas generally have more precipitation, wildfire return intervals are longer than in most of the interior west. A recent study (Zack and Morgan 1994) describing fire history within the Coeur d'Alene Basin indicated that an average of once in every 19 years there was a fire season that burned five percent or more of the study area in a single summer. Historically, in an average summer, fires were patchy with variable intensity. During the periodic drought years, however, there were large stand-replacing crown fires that covered tens of thousands of acres. Catastrophic stand-replacing fires revisited individual forest stands on an average of once every 150 to 250 years.

In the Priest River subbasin, the most significant historic natural disturbance was also fire. Historically, one-third of the landscape in the subbasin would have experienced a stand-replacement fire over a 70-year period, and the majority of the landscape would have experienced a mixed-severity fire (personal communication, Art Zack 1999).

Altering or removing the role of fire will produce significant changes in the ecosystem. On mesic upland areas, the mosaic created by moderately frequent, variable-intensity burns with infrequent high-intensity fires has been altered. Fire suppression efforts have largely eliminated the low-intensity and small, variable-intensity fires from the system. In the absence of low/mixed-severity wildfires that had a thinning effect, young stands of larch were lost to competition. Drier south facing slopes that would have contained mixed, open stands of ponderosa pine, larch and Douglas-fir with little understory now have denser tree cover with a higher component of Douglas-fir and grand fir and understories of dense shrubs or shade-tolerant tree reproduction. On wetter sites, large areas of mature and old growth timber have been fragmented by timber harvest blocks of 20 to 100 acres in size (IPNF 1998). The large tree component, particularly early seral species such as pine and larch, were typically removed. This type of harvest in conjunction with white pine blister rust has removed most of the mature white pine from the Priest River subbasin. Grand fir, western hemlock and Douglas-fir now dominate these sites.

Drier sites have become more susceptible to stand-replacing fires because of multi-storied vegetation structures. The shift from dominance by seral species to shade-tolerant species has made stands much more susceptible to root diseases, dwarf mistletoe, defoliating insects, Douglas-fir beetles and stand replacing wildfires.

Comparison of Historic and Current Forest Vegetation

Personnel from the Idaho Panhandle National Forests in 1997-98 reviewed several historic inventories in the Priest River subbasin in an effort to approximate the natural range of variation in forest vegetation that existed prior to the settlements in the last century (IPNF 1998). In addition, this "geographic assessment" was an attempt to determine measurable levels of change in vegetation over the last century.

Historic inventories and surveys were conducted for various purposes - including landscape characterization, classification of vegetation, and timber volume determination. The earliest of these surveys of the Priest River basin was conducted by John G. Lieberg, Botanist, Department of the Interior-Geological Survey between 1897-98. The report resulting from his survey documented the forest conditions as well as general descriptions of the topography, soils, water and other resources. This report is the earliest documentation of vegetation conditions in the subbasin.

Lieberg mapped the distribution and density of the timber resources. He separated the basin into three general forest zones: white pine, yellow pine, and subalpine, and described the conditions within these zones. He estimated that the white pine zone comprised 80 percent of the basin. "The major tree species within this zone", he stated, "were western white pine and tamarack (i.e. western larch), they accounted for 42 and 35 percent of the entire tree growth. The zone of the yellow pine depended on soil and moisture

conditions, and overlapped with the white pine zone. The main components of the zone were yellow pine (i.e. ponderosa pine), red fir (i.e. Douglas-fir), and white fir (i.e. grand fir). This zone occupied 10 percent of the basin. The remaining area was the subalpine zone at the higher elevations". The analysis area largely is confined to what Lieberg termed the white pine and yellow pine zones, though a small portion of the Pend Oreille Divide lies in the subalpine zone.

Lieberg also addressed the role of fire in the basin. "One meets with burnt areas everywhere -- in the old growth, in the second growth, in the young growth, and where the seedlings are beginning to cover the deforested area. The burnt tracts are in large blocks, thousands of acres in extent, and in small patches of 15 to 50 acres which extend in all directions through the forest. The burnt areas are scattered all over the reserve, but the largest amount of damage lies within the zone of the white pine. The most extensive plats of burnt forest are found in the northern and western portions of the reserve."

Since Lieberg's report (and other earlier reports), the forests of the Priest Lake Basin and north Idaho and eastern Washington have changed dramatically because of fire exclusion and timber harvest. The seral species such as western white pine, larch, and ponderosa pine are greatly reduced, while grand fir, Douglas-fir, cedar and western hemlock forest types are currently at higher levels. This change has created stands which are much more fire-intolerant and prone to forest insects such as the Douglas-fir beetle.

Changes in Forest Composition in the Priest Lake Project Area

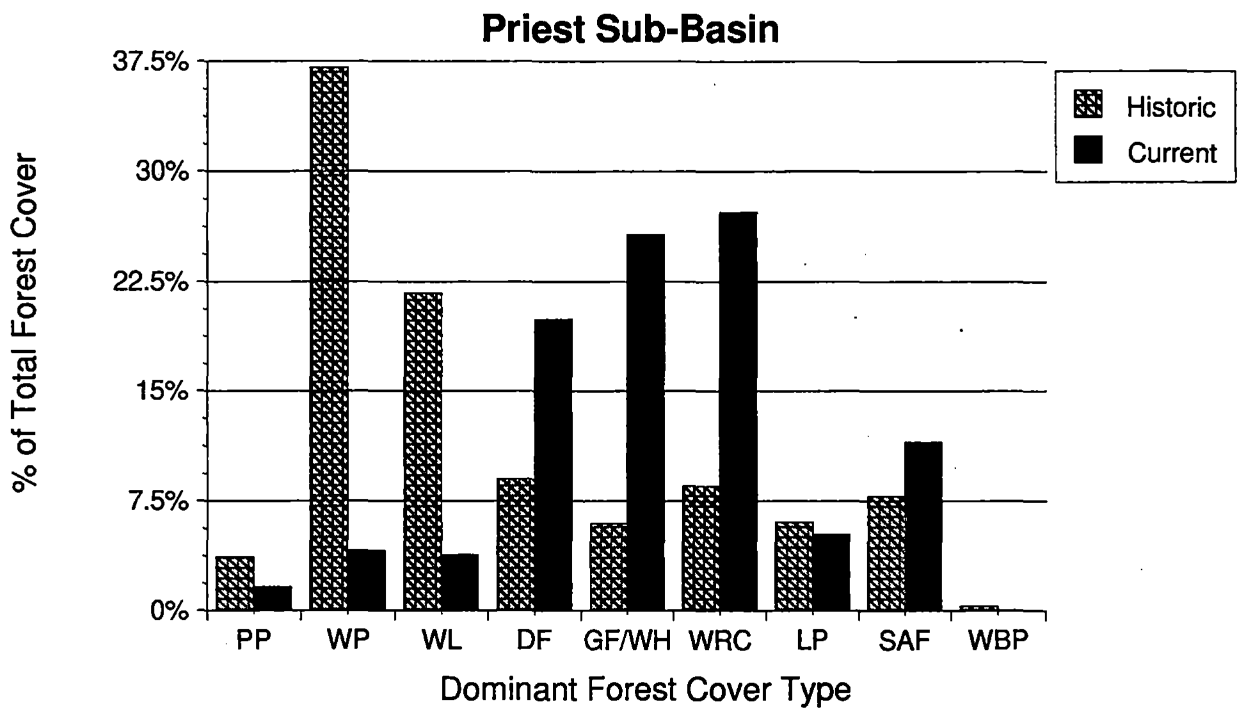
Changes in forest composition and structure were evaluated by comparing historic information from several historic inventories (IPNF 1998) and current information from the Idaho Panhandle National Forests Timber Stand Management Record System data base. The following tables and graphs represent this comparison for the entire Priest River subbasin. Supporting data for the tables and graphs is provided in the Project Files, "Vegetation."

Table III-107. Comparison of historic and current forest composition in the Priest River subbasin, in percent of dominant forest cover type.

Dominant Forest Cover Type*	PP	WP	WL	DF	GF/WH	WRC	LP	SAF	WBP
Historic	3.7	37.1	21.7	9.0	6.0	8.5	6.0	7.8	0.3
Current	1.6	4.1	3.8	19.9	25.7	27.2	5.2	11.5	0.0

*PP = Ponderosa pine; WP = white pine; WL = western larch; DF = Douglas-fir; GF/WH = grand fir/western hemlock; WRC = western red cedar; LP = lodgepole pine; SAF = subalpine fir; WBP = white bark pine

Figure III-8. Comparison of historic and current forest composition in the Priest River subbasin.

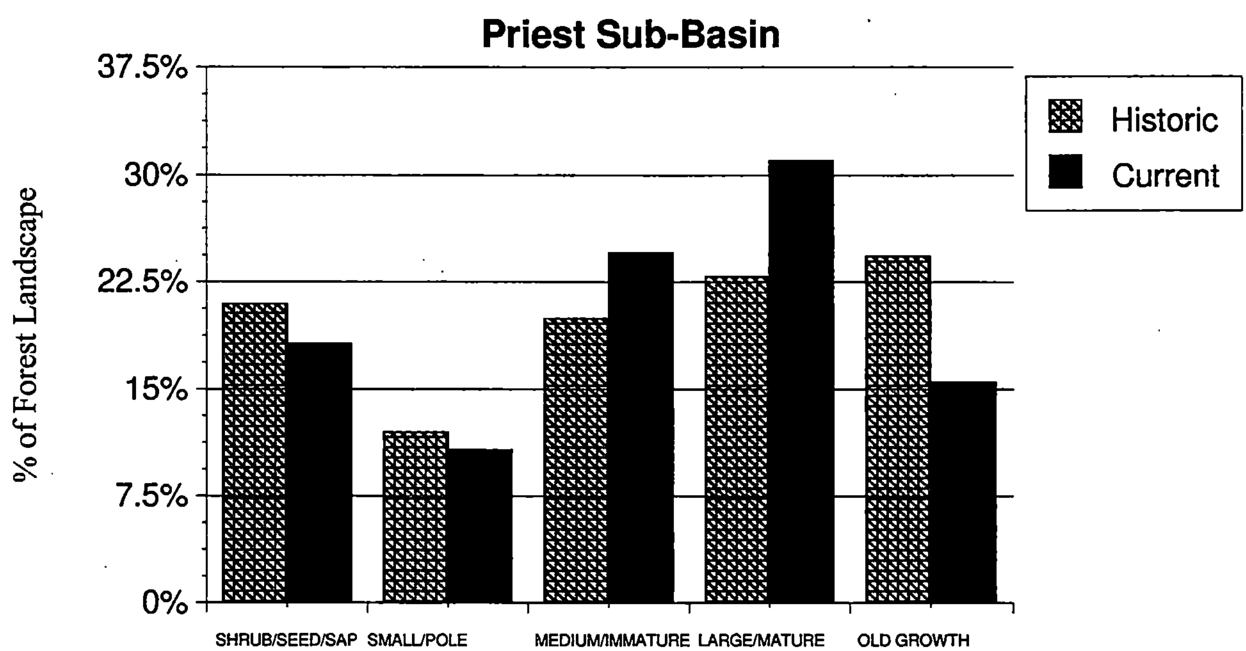


From the above table and graph, it is apparent that major shifts have occurred in forest species composition over the last century. Seral tree species, such as ponderosa pine and western larch, that depend on disturbance and open conditions to regenerate have been substantially reduced by wildfire suppression and selective removal of the more valuable species and the introduction of blister rust. Conversely, the more shade-tolerant Douglas-fir, grand fir, western hemlock and western redcedar have regenerated and persisted in these conditions. Douglas-fir has been very aggressive on the drier sites, invading and dominating without the frequent ground fires and without retention of the thick-barked pine and larch. Grand fir, western hemlock and western redcedar have followed the same encroachment pattern on the more moist sites that historically had significantly higher levels of western white pine and western larch. The western white pine component of the forest has been significantly reduced by past logging practices and decades of fire suppression. But the major influence in this reduction has been the introduction of white pine blister rust. Even though western redcedar has been impacted by aggressive logging of stream-side areas and wetlands, it has encroached into the areas normally influenced by wildfire. Subalpine fir has encroached on the higher elevations and cooler sites due to wildfire suppression. While logging has not significantly impacted white bark pine, the species has also suffered major declines as a result of wildfire suppression and blister rust introduction.

Table III-108. Comparison of historic and current forest structure, in percent of forest cover, in the Priest River subbasin.

Forest Structure	Shrub/Sapling	Small Pole	Medium/Immature	Large/ Mature	Old Growth
Historic	20.9%	12.0%	19.9%	22.9%	24.3%
Current	18.2%	10.7%	24.5%	31.0%	15.5%

Figure III-9. Comparison of historic and current forest structure in the Priest River subbasin).



Forest Stand Size Class

The table and figure above also indicate changes over the last century. Existing shrub/seedling/sapling (openings) and small pole size classes in the Priest River subbasin have been slightly reduced from historic levels. These openings and small size classes are mostly a result of recent timber harvests and small wildfires. Current openings are much smaller and more numerous than those historically influenced by large landscape-level wildfires. Current acreage of medium/immature and large/mature size classes have increased over historic levels.

Residual understories of shade tolerant trees, left after the selective removal of ponderosa pine, western white pine and larch, have advanced into larger size classes. In addition, large wildfires in the Priest River Basin during the years of 1889-1900, 1926 and 1931 (Timber Management Plan, Priest River Working Circle, Kaniksu NF 1957) have regenerated and progressed to these larger size classes. Western white pine, larch, ponderosa pine, and riparian western redcedar old growth have significantly declined with the harvest of large diameter, easily accessible and high-value species. Much of the current old growth is comprised of

shade-tolerant cover types such as western hemlock, cedar and grand fir. This old growth is located primarily on the moist and cool/moist forest habitat type groups.

Old growth Douglas-fir cover types are not extensive, occurring primarily in small patches and on dry ridgelines. In north Idaho, Douglas-fir is a short lived species due to Douglas-fir beetle, root disease, fire and grand fir encroachment.

The loss of old growth has been the most significant forest structure change. Little remains of historic dry-site old growth. Reduced levels of old growth are the result of the elimination of low-intensity wildfires that thinned and allowed the large/mature size class to advance in size. In addition, existing old growth has been fragmented into smaller patches by timber harvest patterns.

The above tables and graphs compare historic forest structure and composition to current levels within the entire subbasin. The majority of beetle-infested and high risk stands are within the drier Lower Priest River Watershed Area. The Douglas-fir beetle generally attacks drier sites.

The table below represents a comparison of the amount of acres by habitat type group between the entire Priest River subbasin, those in the Lower Priest River Watershed Area, and those stands that were actually attacked by the beetles or were at high risk for infestation. Data from Priest subbasin and Lower Priest River Landscape Area are referenced in the project file. Data from the analysis areas for this analysis are compiled from individual Analysis Area data, which are also displayed in this chapter.)

Table III-109. Distribution of habitat type groups (percent) by area.

Area	Dry	Moist	Moderate Subalpine	Upper Subalpine
Priest River subbasin	4%	85%	9%	2%
Lower Priest River Landscape Analysis Area	8%	91%	1%	0%
Beetle-Affected or At Risk Areas	14%	86%	0%	0%

There are more dry sites and sites dominated by Douglas-fir in the lower end of the Priest subbasin, which is where much of the beetle epidemic has taken place. The areas that have been attacked and those determined to be at risk from Douglas-fir beetle are drier sites than in the subbasin as a whole. The beetle activity has built up in the dry sites and moved into adjacent moist habitat type groups with Douglas-fir trees.

Historic forest composition reference conditions, by habitat type group, were developed for the Priest River subbasin Geographic Assessment and are displayed in the table below. Supporting data for the table are provided in the project file, "Vegetation."

Table III-110. Percent historic cover types in dry and moist habitat groups in the Priest River subbasin.

Species Cover Type*	PP	WP	WL	DF	GF/WH	WRC	LP	SAF	WBP
Dry Habitat Group	70%	0%	10%	10%	0%	0%	10%	0%	0%
Moist Habitat Group	1%	42%	24%	10%	7%	10%	5%	1%	0%

PP = ponderosa pine, WP = white pine, WL = western larch, DF = Douglas-fir, GF/WH = grand fir/western hemlock, WRC = western red cedar, LP = lodgepole pine, SAF = subalpine fir, WBP = white bark pine.

The historic species cover types were determined by using the current assessment area habitat type group distribution, determining the cover types represented by those groups, and adjusting the cover types by a weighted average for the specific analysis area. This historic level of cover types was compared to that of known current cover types. The difference represents a measure of the change in forest composition from historic levels. The table below represents this trend.

Table III-111. Comparison of historic and current species cover type distribution (percent) in beetle activity / risk areas.

Cover Type*	PP	WP	WL	DF	GF/WH	WRC	LP	SAF	WBP
Historic	11%	36%	22%	10%	6%	9%	6%	1%	0%
Current	9%	0%	5%	49%	28%	8%	1%	0%	0%

****PP = ponderosa pine, WP = white pine, WL = western larch, DF = Douglas-fir, GF/WH = grand fir/western hemlock, WRC = western red cedar, LP = lodgepole pine, SAF = subalpine fir, WBP = white bark pine.***

The above table represents the forest composition trends of the area infested by the Douglas-fir beetle. Currently, ponderosa pine cover types are slightly less than historic levels. Much of this pine cover type is in small/young structural classes. Additionally, ponderosa pine likely had higher representation as a minor component in dry/moist cover types, even when it was not the dominant cover. Western white pine and western larch have been significantly reduced. The most significant change is evident in the explosion of Douglas-fir cover types. This is most likely due to fire suppression, ponderosa pine and white pine selective logging, and the consequences of blister rust.

This table not only demonstrates that the beetles have attacked the drier sites and sites with significant Douglas-fir, but also suggests that this analysis area has shifted, even more than the entire subbasin, to shade-tolerant, fire-intolerant and drought-intolerant species.

In summary, it is apparent that the current tree component and companion understory vegetation are much different from those prior to more recent human influences. Forest structure and composition are well outside natural ranges of variation.

Existing Condition

Current Douglas-fir Beetle Outbreak

A significant endemic population of Douglas-fir beetles effectively reproduced in the large number of Douglas-fir that were wind-thrown and broken by snow/ice during the winter of 1996-97. The beetles expanded by successfully building up in the large, downed Douglas-fir material in the spring and summer of 1997. Some standing, large diameter Douglas-fir were attacked during this same period, but many more additional standing Douglas-fir trees were attacked in the spring of 1998. The warm, dry summer of 1998 provided optimum conditions for a late summer beetle flight. With the trees in a weakened condition due to the dry summer and the explosive stage of beetle development, Douglas-fir mortality reached an epidemic level. Green trees covered with beetle boring dust (frass) were observed during this late summer period. Special traps placed in the woods to monitor beetle flight indicated the beetle activity was epidemic in level.

Aerial detection flights were used to assess the initial location and magnitude of the outbreak. The number of dead trees varied from a few scattered individuals to entire stands where most of the large Douglas-fir have been killed. The detection flights could only identify those trees which were showing symptoms (yellow or red crowns) of the Douglas-fir beetle attacks. There may have been some areas, where affected trees were not yet showing symptoms, which were not mapped during the flight.

Field inspections indicated that the number of trees actually attacked by beetles was much higher than the number of trees showing the symptoms of these attacks. Results of preliminary ground surveys show that there were an average of 19 green infested trees for every fading tree. Groups of from three to 200 trees were beginning to fade by the fall of 1998. The full extent of the 1998 infestation won't be readily apparent from aerial surveys until the remaining currently infested trees fade during summer 1999.

Based on aerial detection flights and field examinations, an estimated 11,000 acres of mortality will be caused by the Douglas-fir beetle within the five analysis areas on the Priest Lake Ranger District.

Douglas-fir beetle outbreaks are generally of short duration in the coastal Douglas-fir region but last longer in the Rocky Mountains (Furniss and Carolin 1980). Outbreaks average four years in eastern Washington (Flanagan 1998). Beetle populations are expected to decline over the next two years, but additional tree mortality is expected.

Weather may influence the survival of Douglas-fir beetle populations. Cool, wet conditions in the spring during the beetles' flight period are probably more important than cold winter temperatures. Constant cool, rainy spring weather may disrupt the flight period and cause the beetles to be exposed to adverse conditions for longer than normal periods of time. Conversely, warm dry weather in the spring is beneficial to the beetles. Cold temperatures experienced by overwintering Douglas-fir beetles have been recorded only once as causing significant beetle mortality. This occurred in 1955 when extreme sudden and severe cold weather occurred in early November in British Columbia at a time when the beetles were probably not yet prepared for such conditions (McMullen 1956). However, severe temperatures that occurred in mid-November of the same year and again in February 1956 in Idaho failed to cause widespread unusual overwinter mortality of Douglas-fir beetles (Furniss 1956). More detailed temperature studies have been conducted on a closely related bark beetle, the mountain pine beetle. Winter temperatures below -34 degrees Fahrenheit may affect mountain pine beetles infesting lodgepole pine in low-lying areas; however, beetles survive on warmer slopes, in thicker barked trees and in portions of tree trunks below snow line (Amman et al. 1989). It is reasonable to conclude that survival would be greater for Douglas-fir beetles in thicker barked Douglas-fir trees. Air temperatures below -20 degrees Fahrenheit for several days in December 1990 were insufficient to cause a decreasing population trend in mountain pine beetles in ponderosa pine (Schmid et el. 1993).

Several natural enemies have been recorded feeding on Douglas-fir beetles. Among those regarded as important in natural control of the Douglas-fir beetle are the predatory beetles *Enoclerus sphegeus, Thanasimus undatulus*, and *Temnochila chlorodia*; and the parasites *Coeloides vancouverensis* and *Medetera aldrichii* (Marsden et al. 1981, Furniss & Carolin 1980). However, numbers of natural enemies appear to be independent of prey density. Their influence increases after the bark beetle population subsides. Douglas-fir beetle populations are maintained at normal levels primarily by tree resistance (Furniss et al. 1981). Woodpeckers are not important predators of the Douglas-fir beetle (Schmitz & Gibson 1996).

The current beetle outbreak could be as large as those that occurred in the early 1950s and 1970s, especially if drought conditions continue. A group of researchers (see Chapter III Overview) was assembled in December of 1998 to review this specific beetle outbreak. They estimate the IPNFs have currently experienced about fifty percent of the total mortality that will develop. Because past outbreaks were measured in terms of the amount of commercial timber lost (i.e. millions of board feet), comparisons between those outbreaks and the current infestation use the same parameters. Based on data from past outbreaks and conservative estimates of the current outbreak, between 38 million and 100 million or more board feet of timber could be killed by the time this Douglas-fir beetle outbreak runs its course. In addition, at this stage of the beetle epidemic, human actions are reasonably unable to stop the remaining beetle attack.

Methodology

The information provided below comes from a variety of sources. The extent and location of current bark beetle infestations was based on aerial insect detection flights conducted in late summer of 1998 and field surveys of sites with active beetle populations. The extent of bark beetle activity that is projected to occur over the next several years is based on information from area entomologists and scientific studies. Locations of projected bark beetle activity are based on current infestations and a hazard analysis of stands within the project area. Information for National Forest Lands on habitat types, forest cover types, forest structural stage and past harvest activity are based on existing data bases that were developed from stand exam information, historical records and aerial photo interpretation. Not all lands have a complete inventory, but as shown in the narrative to the existing condition tables, a very high percentage of the lands have information on which to base this analysis.

Existing condition is a result of all past and current disturbance. Changes in structural stages that resulted from past activities (including fires) are reflected in the table above. For example, most stands in the shrub/seedling/sapling stage have resulted from past regeneration harvests; however, this stage does include some areas that are naturally non-forested due to soil or other environmental conditions.

Information on private lands within the project area is limited. Private lands tend to have more of the drier habitat types because they are generally lower in elevation and receive less moisture. Although regeneration harvests have created some openings in the forest canopy, existing openings are mostly a result of permanent land clearing for homes and pastures. Timber harvests on private lands often tend to be selective removal of trees of highest economic value (usually the largest), and natural regeneration is relied on to fill in any created openings. This practice tends to favor shade-tolerant Douglas-fir and grand fir over early seral species such as pine and larch. Also, with this tendency to harvest the larger, older trees, there is not expected to be much large/mature or old growth structure on private lands. Douglas-fir beetles are active on private lands where Douglas-fir of sufficient size and density are present.

A summary of disturbance history (human settlement, fire, logging, etc.) is provided for each analysis area. This history was compiled by Priest Lake Ranger District personnel using John Lieberg's 1897 report on the Priest River Forest Reserve, historic fire occurrence maps, aerial photographs, historic logging and plantation records, the memoirs of Henry Peterson "Early Days in the Forest Service, Volume 4" (Peterson was a 30-year career employee and District Ranger on the Kaniksu NF), and numerous other sources.

Watson Analysis Area

Lakeface-Granite Watershed

The Lakeface-Granite Watershed Area is approximately 15,403 acres in size. Vegetation information is available for approximately 80 percent of this area.

Table III-112. Habitat type groups in the Lakeface-Granite Watershed Area.

Habitat Type Group	Approximate Acres	% of All Forest Lands
Dry (Groups 1,2,3)	792	6%
Moist (Groups 4,5,6)	11,322	92%
Cool/Moist (Groups 7 and 8)	62	<1%
Cool/Dry (Groups 9,10,11)	63	<1%

Table III-113. Forest cover types in the Lakeface-Granite Watershed Area.

Forest Cover Types	Approximate Acres	% of All Forest Lands
Douglas-fir	2,851	24%
Grand fir	6,039	50%
Ponderosa Pine	0	0%
Western Larch	363	3%
Western Redcedar	1,643	13%
Lodgepole Pine	310	3%
Subalpine fir	51	<1%
Western White Pine	802	7%
Non Forest	248	2%

Table III-114. Structural age classes in the Lakeface-Granite Watershed Area.

Structural Stage	Approximate Acres	% of All Forest Lands
Shrubs/Seedlings/Saplings	1,887	15%
Small pole	811	7%
Medium/Immature timber	1,309	11%
Large mature	5,306	44%
Old growth	2,739	23%

Disturbance History of the Lakeface-Granite Watershed - The Granite Creek portion of the analysis area includes Lower Granite Creek and its lower tributaries. Additionally, several smaller lakeface drainages including Tepee, Bottle, and Tango Creek drain directly into Priest Lake.

As with the Binarch area, a large portion of Lower Granite Creek burned in the 1890 fire. The Douglas-fir beetle areas are concentrated in stands regenerated following that fire. Areas which escaped this wildfire include much of the Granite Creek stream corridor, upper Jost Creek, the Distillery Bay area, and Tango Creek north to Tepee Creek. Much of this unburned area is either included in the Tepee and Bottle Lake Research Natural Areas (RNAs) or classified as cedar and hemlock old-growth. Large fires also burned in 1917 west of Granite Creek and in 1925 and 1926 over portions of Packer and Fedar Creeks; both are tributaries of Granite Creek. A portion of the 1925-1926 burned area was planted with ponderosa pine, western white pine and eastern white pine. Because non-local seed sources were used, very few of the ponderosa pine and eastern white pine survive. White pine blister rust also killed many of the western white pine.

Limited historic logging existed in this portion of the analysis area. There is evidence of scattered stumps in the streambottom of Granite Creek, mostly large cedar and white pine stumps. In 1927 the Dalkena Lumber Company logged the fire-killed in 1927 in Fedar Creek. The timber was floated down Granite Creek into Priest Lake that following spring. The next logging occurred in the Jost Creek and upper Blacktail drainages in the 1950s; these were large clearcuts. Scattered even-aged logging has occurred since that time.

The lower portion of this drainage contains scattered segments of private land. These lands were homesteaded in the late 1800s and early 1900s. A majority of these acres have been subdivided and developed as residential or recreational properties. Logging has occurred over most of these acres, removing mostly the larger, more valuable trees. Four parcels of private industrial land exist in this section; these have been all logged.

Table III-115. Past timber harvest and fires in the Lakeface-Granite Watershed Area.

Timber Harvest and Fire	Approximate Acres	% of All Forest Lands
Regeneration Harvests	2,820	23%
Overstory Removal	85	<1%
Sanitation/Salvage	859*	7%
Commercial Thinning	440	4%
Fires since 1950	0	0%

* *These areas have been harvested several times so actual acreage impacted is considerably less.*

Lower Priest Analysis Area

The Lower Priest Area is approximately 130,410 acres in size. For analysis purposes, this area has been described by four watershed areas: Binarch/Lamb, Upper West Branch, Lower West Branch, and Quartz.

Binarch/Lamb Watershed

The Binarch/Lamb watershed is approximately 27,551 acres in size. Vegetation information is available for approximately 86 percent of this area.

Table III-116. Habitat types in the Binarch/Lamb Watersheds.

Habitat Type Group	Approximate Acres	% of All Forest Lands
Dry (Groups 1,2,3)	2,303	10%
Moist (Groups 4,5,6)	21,205	90%
Cool/Moist (Groups 7 and 8)	0	0%
Cool/Dry (Groups 9,10,11)	0	0%

Table III-117. Forest cover types in the Binarch/Lamb Watershed.

Forest Cover Types	Approximate Acres	% of All Forest Lands
Douglas-fir	7,861	35%
Grand fir	4,953	22%
Ponderosa Pine	630	3%
Western Larch	3,920	18%
Western Redcedar	2,067	9%
Western White Pine	2,350	11%
Subalpine Fir	217	1%
Non Forest	301	1%

Table III-118. Structural age classes in the Binarch/Lamb Watershed.

Structural Stage	Approximate Acres	% of All Forest Lands
Shrubs/Seedlings/Saplings	5419	23%
Small pole	1624	7%
Medium/Immature timber	3258	14%
Large mature	11995	50%
Old growth	1126	5%

Disturbance History of Binarch-Lamb Creeks Watershed - This section includes the Binarch and Lamb Creek drainages as well as the upper end of the Reynolds Creek drainage and a small overlap into the Kalispell Creek drainage. Practically all of the Binarch Creek and a major portion of the Lamb Creek drainage burned in a large wildfire in either 1889 or 1890. One notable exception is the area presently included in the Binarch RNA. This fire was largely a stand-replacing fire leaving either pockets of trees or individual trees in more protected locations. The Douglas-fir infestation through this section of the analysis area is focused on the area burned in this wildfire. Large fires in 1925, 1926, and 1939 burned the upper portion of the Lamb Creek drainage and a large portion of lower Reynolds Creek. Plantations of western white pine and ponderosa pine were established on portions of the area that burned in 1939.

Because of these large fires, little historic logging occurred in these drainages except in the isolated parcels that had not burned. A salvage of fire-killed timber occurred in upper Lamb Creek in 1927; the timber was hauled out by log trucks and dumped into Priest Lake at Kalispell Bay for the spring log drive. The majority of the harvest activity has happened since 1960 in these drainages. Most of this more recent logging has been even-aged treatments such as clearcut, seed-tree and shelterwood silvicultural systems. Most of these units now are stocked with sapling or small pole-sized trees.

No private land exists in Binarch Creek proper. Several parcels of private land are scattered through the remaining portion of this analysis area. These parcels were homesteaded in the late 1800s, and land-clearing occurred for agricultural purposes. These lands largely lies along the streambottom or surrounds natural meadows. Many of these lands, especially in the lower portion of Lamb Creek, have been subdivided into residential and commercial properties. One unlogged parcel of industrial forest land exists in the upper portion of Lamb Creek; this 106-acre piece burned in 1890 and 1926.

Table III-119. Past timber harvest and fires in the Binarch/Lamb Watershed.

Timber Harvest and Fire	Approximate Acres	% of All Forest Lands
Regeneration Harvests	5,328	22%
Overstory Removal	2,403	10%
Sanitation/Salvage	2,341*	10%
Commercial Thinning	4,382	18%
Fires since 1950	258	1%

* *These areas have been harvested several times so actual acreage impacted is considerably less.*

Upper West Branch Watershed

The Upper West Branch watershed is approximately 45,440 acres. Vegetation information is available for approximately 92 percent of this area.

Table III-120. Habitat types in the Upper West Branch Watershed.

Habitat Type Group	Approximate Acres	% of All Forest Lands
Dry (Groups 1,2,3)	1529	4%
Moist (Groups 4,5,6)	38,692	92%
Cool/Moist (Groups 7 and 8)	1077	3%
Cool/Dry (Groups 9,10,11)	505	1%

Table III-121. Forest cover types in the Upper West Branch Watershed.

Forest Cover Types	Approximate Acres	% of All Forest Lands
Douglas-fir	7,861	19%
Grand fir	11,679	29%
Ponderosa Pine	761	2%
Western Larch	1,955	5%
Western Redcedar	11,757	29%
Lodgepole Pine	1,932	5%
Subalpine Fir	2,215	5%
Western White Pine	1,661	4%
Non-forest	940	2%

Table III-122. Structural age classes in the Upper West Branch Watershed.

Structural Stage	Approximate Acres	% of All Forest Lands
Shrubs/Seedlings/Saplings	9,215	22%
Small pole	3,497	8%
Medium/Immature timber	7,679	18%
Large mature	13,785	33%
Old growth	6,746	16%

Disturbance History of the Upper West Branch Watershed - The entire drainage of the Upper West Branch of Priest River is included in the analysis area. Approximately 60-65 percent of the drainage burned over in wildfires in 1880, 1889, and 1890. Practically the upper end of the drainage (including Solo Creek) burned, as well as the entire area lying north of the Upper West Branch itself. Large portions of Upper and Lower Goose Creek escaped these fires. Large fires also burned in the upper reaches of the Upper West Branch in 1925 and 1926, and reburned in the Gleason Mountain Fire of 1939. A 1979 fire history study in Goose Creek suggested an average fire-free interval of 50-150 years in the upland cedar-hemlock types characterizing this drainage (Arno and Davis p.21).

A portion of the 1912 Dalkena timber sale, discussed above in the Lower West Branch section, extended into the Upper West Branch where the large wildfires of the 1880s and 1890 did not burn. Railroads were built paralleling the stream to access the areas and to haul the logs to the river at Dickensheet, where they were dumped and floated into the mills. This sale lasted until 1930. Since that time, portions of the entire drainage have been logged, except the headwater drainages which burned in the 1920s and 1939. This area is included as part of the Hungry Mountain Roadless area, and is characterized by seral species. Harvest treatments have included even-aged treatments, commercial thinnings, and other intermediate treatments such as sanitation and salvage harvests.

Private land in the drainage is concentrated in the bottomlands of the Upper West Branch, especially in the Big Meadows area. Homesteaders cleared land adjacent to these natural meadows in the early years of the century. Much of this land is still used for agriculture, primarily grazing and hay-raising. An estimated 80-85 percent of the private land is non-forested. Logging has occurred on the forested private lands with, the most recent harvesting done the past five years.

Table III-123. Past timber harvest and fires in the Upper West Branch Watershed.

Timber Harvest and Fire	Approximate Acres	% of All Forest Lands
Regeneration Harvests	8,427	20%
Overstory Removal	1,846	4%
Sanitation/Salvage	1,768*	4%
Commercial Thinning	2,975	7%
Fires since 1950	0	0%

** These areas have been harvested several times so actual acreage impacted is considerably less.*

Lower West Branch Watershed

The Lower West Branch watershed is approximately 47,848 acres in size. Vegetation information is available for approximately 78 percent of this area.

Table III-124. Habitat types in the Lower West Branch Watershed of the Lower Priest Area.

Habitat Type Group	Approximate Acres	% of All Forest Lands
Dry (Groups 1,2,3)	3,309	9%
Moist (Groups 4,5,6)	33,690	90%
Cool/Moist (Groups 7 and 8)	216	1%
Cool/Dry (Groups 9,10,11)	21	<1%

Table III-125. Forest cover types in the Lower West Branch Watershed of the Lower Priest Area.

Forest Cover Types	Approximate Acres	% of All Forest Lands
Douglas-fir	9,480	25%
Grand fir	8,988	24%
Ponderosa Pine	599	2%
Western Larch	2,252	6%
Western Redcedar	12,436	33%
Lodgepole Pine	444	1%
Subalpine fir	835	2%
Western White Pine	1,542	4%
Non Forest	721	2%

Table III-126. Structural age classes in the Lower West Branch Watershed of the Lower Priest Area.

Structural Stage	Approximate Acres	% of All Forest Lands
Shrubs/Seedlings/Saplings	6,865	19%
Small pole	3,111	9%
Medium/Immature timber	3,991	11%
Large mature	16,132	45%
Old growth	5757	16%

Disturbance History of the Lower West Branch Watershed - This section of the analysis area includes the entire Lower West Branch of the Priest River drainage. Lieberg mapped this portion of the basin as dominated by white pine and tamarack (i.e. larch) in the lower part of the drainage and red fir (Douglas-fir) and tamarack along the Pend Oreille Divide and some of the south-facing slopes. A large portion of the Lower West Branch was mapped as "burnt area, mostly restocked."

Lieberg wrote more about the fires in the basin and in the Lower West Branch, "Of the 540,000 acres that make up the white pine and yellow pine zones, there are not 80,000 acres that are not seared by fire. Excepting a small area of about 1,600 acres along the Lower West Fork (i.e. Lower West Branch), there is no body of timber of 1,000 acres, or even 500 acres, extent not scorched by fire."

Historic fire records exist for the Priest Lake Ranger District. The earliest fire in the Lower West Branch was dated as 1875 and burned a few hundred acres in West Moores Creek. The huge 1890 fire extended southward from the Upper West Branch drainage into upper Falls Creek. Based on these records, it would appear that the majority of the Lower West Branch had burned earlier in the 19th century and pre-dated settlement of the Priest Lake Basin. Large fires, each averaging several hundred acres, burned in scattered locations in 1900, 1910, 1915, 1917, 1918, 1919, 1920, 1924, 1936 and 1937. The largest fire in historical times in the Lower West Branch drainage was the Freeman Lake fire of 193, which swept across the lower portion of the drainage after starting north of Newport, Washington. Several homesteads were burned in this large event. Many of these fire events were successive fires, where the fire re-burned areas that had burned a few years previously because of the buildup of fuels resulting from the first fir.

The first logging in the Priest Lake basin occurred in this drainage. Lieberg commented in 1899, "During the last summer, parties were cutting the white pine on Lower West Fork and floating it to the Great Northern Railway crossing of Priest River, whence it was shipped. Ostensibly, the cutting was done with a view of furnishing samples of western white pine to lumbermen in the East."

The Lower West Branch has had a long history of logging. "The largest timber sale in the Northern Region" included several thousand acres in the Lower West Branch and Upper West Branch drainages. This sale was sold to Dalkena Lumber Company in 1912, and continued until the summer of 1930. The total volume was estimated to be 263 million board feet on 18,240 acres in the Lower and Upper West Branch drainages. The sale was concentrated in the area that Lieberg labelled "second growth." Most of the harvesting was selective logging, removing the larger and more valuable trees. A succession of sales have occurred on National Forest lands since that time. A majority of the logging since the 1960s has consisted of even-aged harvest methods such as clearcut, seed-tree and shelterwood. Most of the units were planted, and the trees range from seedlings to pole-sized timber on these more recently logged areas.

As with the other portions of the analysis area, the Lower West Branch originally was in a checkerboard ownership pattern, with the Northern Pacific Railroad originally owning the odd-numbered sections. Most of these sections were either homesteaded or sold to large timber companies, such as Diamond Match and Humbird Lumber Company, until the Forest Service acquired these lands through large exchanges in the 1930s.

Large portions of the drainage were homesteaded beginning in the 1890s. Homesteading was focused in the lower portion of the drainage, where settlers cleared the flatter lands for agricultural purposes or filed on homesteads for the timber rights. Some of these lands were later acquired by the Forest Service through land exchanges, but most remain in private ownership. Most of these lands presently are individually owned, but there are scattered parcels of industrial timber land. Virtually the entire acreage of these private lands has been logged, as evidenced by either the land clearing or by old stumps. Based on estimates from aerial photos, roughly 50-60 percent of the private lands in the Lower West Branch portion remain forested.

Table III-127. Past timber harvest and fires in the Lower West Branch Watershed.

Timber Harvest and Fire	Approximate Acres	% of All Forest Lands
Regeneration Harvests	7,680	21%
Overstory Removal	2,469	7%
Sanitation/Salvage	3,941	11%
Commercial Thinning	2,053	6%
Fires since 1950	0	0%

There are approximately 3,329 acres of National Forest lands within the Lower West Branch watershed that have beetle-caused mortality. The table below provides information on the estimated effect bark beetles have had on stand basal areas on National Forest land.

Table III-128. Estimated current Douglas-fir beetle-related mortality in the Lower West Branch Watershed.

% of Basal Area Mortality	Approximate Acres	% All Forest Land
0 - 10	7	<1%
11 - 25	1,805	4%
26 - 50	1,366	3%
51 - 100	151	<1%

Quartz Watershed

The Quartz watershed is approximately 9,748 acres in size. Vegetation information is available for approximately 81 percent of this area.

Table III-129. Habitat types in the Quartz Watershed.

Habitat Type Group	Approximate Acres	% of All Forest Lands
Dry (Groups 1,2,3)	545	7%
Moist (Groups 4,5,6)	7,008	93%
Cool/Moist (Groups 7 and 8)	0	0%
Cool/Dry (Groups 9,10,11)	0	0%

Table III-130. Forest cover types in the Quartz Watershed.

Forest Cover Types	Approximate Acres	% of All Forest Lands
Douglas-fir	1,891	24%
Grand fir	2,770	36%
Ponderosa Pine	79	1%
Western Larch	545	7%
Western Redcedar	1,865	24%
Lodgepole Pine	53	1%
Subalpine fir	46	<1%
Western White Pine	277	4%
Non Forest	198	3%

Table III-131. Structural age classes in the Quartz Watershed.

Structural Stage	Approximate Acres	% of All Forest Lands
Shrubs/Seedlings/Saplings	890	12%
Small pole	1,777	24%
Medium/Immature timber	1,365	18%
Large mature	3,117	41%
Old growth	374	5%

Disturbance History of the Quartz Watershed - The Quartz portion of the analysis area includes the Murray Creek, Cottonwood and Quartz Creek drainages, and several smaller streams which drain directly into Priest River. Two large wildfires swept this sub-unit of the analysis area about 70 years ago. The area east of Jasper Mountain had previously burned in 1875. The 1926 wildfire burned the upper Quartz Creek drainage and extended northward through Cottonwood and Murray Creeks. Lower Quartz Creek burned in the Freeman Lake fire of 1931. Only about 1,000 acres located in two pockets escaped these two fires -- one in the upper northwest corner of Quartz Creek and the other in Steep Creek, a tributary located in the lower reaches of the stream. These fires were stand-replacement events, leaving only scattered trees or pockets of trees in more open or more sheltered locations. Scattered areas, especially in the Quartz Creek drainage, were planted with off-site ponderosa pine by the Civilian Conservation Corps (CCC) in the 1930s. Most of the Douglas-fir beetle outbreak in this area corresponds to that area burned in 1875 and the portion of Steep Creek that did not burn in 1931.

Because of the 1926 and 1931 fires, most of the timber in these drainages is either pole-sized or immature sawtimber. Small tracts were selectively logged prior to these fires. Most of the logging in these drainages, however, has occurred since 1980. Many of the harvests have been commercial thinnings and removal of the scattered overstory that escaped the earlier fires.

The Quartz area was homesteaded at the same time as the Lower West Branch. Many of these homesteads were cleared for agricultural purposes, especially in the valley bottoms of Quartz and Cottonwood Creeks. Roughly, about 20-30 percent of the private lands remain cleared. Most private land now consists of small, individually-owned parcels. One parcel of industrial forest land was logged in the early 1990s in the Quartz Creek drainage.

Table III-132. Past timber harvest and fires in the Quartz Watershed of the Lower Priest area.

Timber Harvest and Fire	Approximate Acres	% of All Forest Lands
Regeneration Harvests	661	9%
Overstory Removal	544	7%
Sanitation/Salvage	1,009	13%
Commercial Thinning	245	3%
Fires since 1950	0	0%

ENVIRONMENTAL CONSEQUENCES

Methodology

Refer to the tables in Appendix D for unit-by-unit descriptions of harvest prescriptions, logging systems and fuels treatments proposed under each alternative.

Terrestrial analysis data for the IPNF North Zone Geographic Assessment (in progress) indicate that most of the proposed treatment areas are considered to be a high priority for vegetation restoration of long-lived seral species. A copy of the "Priest, Kootenai and Pend Oreille Terrestrial Strategy Zones" map displaying the priority areas is included in the project file. From a vegetation standpoint, the effects of the Douglas-fir beetle epidemic and resulting proposed harvest activities on species composition and stand structure will be used to determine environmental consequences to the vegetation.

The action alternatives include the effects of infestation, both in areas proposed for treatment and in areas not proposed for treatment. In Alternative D, effects are shown for all stands that would

be treated if they are or will become infested. (A portion of these stands are either lightly infested and not considered feasible for entry at this time or they are projected to become infested with the future beetle flights).

In all action alternatives, regeneration harvest would not be proposed in areas that are unsuitable for reforestation in a timely manner as described in Forest Service policy.

The reasonably foreseeable time frames for the beetle epidemic and activities associated with the action alternatives would be approximately 5-7 years.

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

Effects Common To All Alternatives

Under all alternatives, the mortality levels and acres of mortality which would occur are not expected to change substantially between no action and any action alternative. Under all alternatives, the stand structures would not change substantially between the no action and any action alternative (e.g. stands that will change from mature timber to seed/sap because of the Douglas-fir beetle activity are the same stands that have been proposed for harvesting and regenerating in the action alternatives).

Throughout the watersheds described in this analysis, there will continue to be growth of vegetation in all areas. All of these watersheds have seedling/sapling stands of western larch, white pine and ponderosa pine that are trending toward desired species compositions while other stands have much Douglas-fir, grand fir, hemlock and cedar. In many situations, a thinning to favor the larch and pine species is needed and is planned for as funding becomes available. In other portions of these watersheds, in the mature stands growth is declining and mortality is increasing. This process will accelerate, especially in the Douglas-fir forest cover type, as Douglas-fir is generally a much shorter-lived species than white pine, ponderosa pine, and western larch on many sites in northern Idaho. Disturbance events such as insect infestations, disease and weather events are expected to continue to change the structure of these stands. Fire control efforts have been very successful for a number of years, which has also contributed to the increase in these disturbances. Large scale stand-replacement fire disturbance can be expected to eventually change much of the stand structures in these watersheds, but the timing of these events is not predictable.

Effects Common To Alternatives B, C, D, E And F

At this time, there is no known literature displaying Douglas-fir beetle-infested timber, which has been transported to milling facilities, causing further infestation. Although no literature exists, other species of beetles transported in timber to milling sites have been known to serve as a source for spread of beetle activity. In this Douglas-fir beetle infestation, most trees to be removed will be dead Douglas-fir trees from which the beetles have emerged prior to logging activities. This timber would cause no spread of Douglas-fir beetles. A lesser portion of the trees removed would be infested with beetles and larvae at the time of removal and would be transported to mill sites. Prior to the beetles' emergence from the timber most logs would be processed (i.e. debarked), which would kill the beetle and larvae. If milling is not completed prior to emergence, the possibility of beetle spread could exist. Techniques such as water sprinklers set on log decks, using pheromone attractants in traps, and anti-attractants in susceptible stands surrounding mill sites could reduce the chance of beetles leaving the log processing plants.

The following five tables display the mortality, structural, and cover type change on forest vegetation for the No Action Alternative A and Action Alternatives B, C, D, and E. The previous Existing Condition tables that were displayed represented the past and present actions. The future foreseeable actions are shown in next five tables, the narratives following those tables, and in the cumulative effects discussion at the end of this chapter.

Table III-133. Current condition and predicted changes to the vegetation in the Lakeface Granite watershed.

	Existing		No Action		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F		Alt. G	
	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%
Structural Stage																
Seed/Sap	1,887	15	2,341	19	2,341	19	2,341	19	2,341	19	2,341	19	2,341	19	2,341	19
Pole	811	7	811	7	811	7	811	7	811	7	811	7	811	7	811	7
Immature	1,309	11	1,309	11	1,309	11	1,309	11	1,309	11	1,309	11	1,309	11	1,309	11
Mature	5,306	43	4,852	39	4,852	39	4,852	39	4,852	39	4,852	39	4,852	39	4,852	39
Moist Old Growth	2,739	22	2,739	22	2,739	22	2,739	22	2,739	22	2,739	22	2,739	22	2,739	22
Dry Old Growth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Forest	255	2	255	2	255	2	255	2	255	2	255	2	255	2	255	2
Cover Type																
DF	2,851	23	2,340	19	2,126	17	2,126	17	2,033	17	2,126	17	2,281	19	2,340	19
GF	6,039	49	6,550	53	6,447	52	6,447	52	6,394	52	6,550	53	6,394	52	6,550	53
LP	310	3	310	3	310	3	310	3	310	3	310	3	310	3	310	3
PP	0	0	0	0	298	2	298	2	376	3	195	2	147	1	0	0
Non-Forest	248	2	248	2	248	2	248	2	248	2	248	2	248	2	248	2
SAF	51	<1	51	<1	51	<1	51	<1	51	<1	51	<1	51	<1	51	<1
WL	363	3	363	3	363	3	363	3	431	4	363	3	363	3	363	3
WP	802	7	802	7	821	7	821	7	821	7	821	7	870	7	802	7
WRC	1,643	13	1,643	13	1,643	13	1,643	13	1,643	13	1,643	13	1,643	13	1,643	13

Table III-134. Current condition and predicted changes to the vegetation in the Binarch Lamb watershed.

	Existing		No Action		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F		Alt. G	
	Approx Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%
Structural Stage																
Seed/Sap	5,419	23	6,288	27	6,288	27	6,288	27	6,288	27	6,288	27	6,288	27	6,288	27
Pole	1,624	7	1,624	7	1,624	7	1,624	7	1,624	7	1,624	7	1,624	7	1,624	7
Immature	3,258	14	3,643	15	3,643	15	3,643	15	3,643	15	3,643	15	3,643	15	3,643	15
Mature	11,995	51	10,741	45	10,741	45	10,741	45	10,741	45	10,741	45	10,741	45	10,741	45
Moist Old Growth	1,056	4	1,056	4	1,056	4	1,056	4	1,056	4	1,056	4	1,056	4	1,056	4
Dry Old Growth	70	<1	70	<1	70	<1	70	<1	70	<1	70	<1	70	<1	70	<1
Non-Forest	311	1	311	1	311	1	311	1	311	1	311	1	311	1	311	1
Cover Type																
DF	7,861	33	7,109	30	6,580	28	6,580	28	6,580	28	6,871	29	6,786	29	7,109	30
GF	4,953	21	5,472	23	5,450	23	5,450	23	5,450	23	5,450	23	5,450	23	5472	23
LP	1,434	6	1,434	6	1,434	6	1,434	6	1,434	6	1,434	6	1,434	6	1,434	6
PP	630	3	641	3	924	4	924	4	924	4	817	3	881	4	641	3
Non-Forest	301	1	301	1	301	1	301	1	301	1	301	1	301	1	301	1
SAF	217	1	217	1	217	1	217	1	217	1	217	1	217	1	217	1
WL	3,920	16	4,001	17	4,235	18	4,235	18	4,235	18	4,029	17	4,072	17	4,001	17
WP	2,350	10	2,350	10	2,384	10	2,384	10	2,384	10	2,406	10	2,384	10	2,350	10
WRC	2,067	9	2,208	9	2,208	9	2,208	9	2208	9	2,208	9	2,208	9	2208	9

Table III-135. Current condition and predicted changes to the vegetation in the Upper West Branch watershed.

	Existing		No Action		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F		Alt. G	
	Approx Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%
Structural Stage																
Seed/Sap	9,215	22	10,699	26	10,699	26	10,699	26	10,699	26	10,699	26	10,699	26	10,699	26
Pole	3,497	8	3,497	8	3,497	8	3,497	8	3,497	8	3,497	8	3,497	8	3,497	8
Immature	7,679	18	7690	18	7690	18	7690	18	7690	18	7690	18	7690	18	7690	18
Mature	13,785	33	12,290	29	12,290	29	12,290	29	12,290	29	12,290	29	12,290	29	12,290	29
Moist Old Growth	6,558	16	6,651	16	6,651	16	6,651	16	6,651	16	6,651	16	6,651	16	6,651	16
Dry Old Growth	188	1	95	<1	95	<1	95	<1	95	<1	95	<1	95	<1	95	<1
Non-Forest	940	2	940	2	940	2	940	2	940	2	940	2	940	2	940	2
Cover Type																
DF	9,196	22	8,069	19	7,558	18	7,558	18	7,331	18	7,705	18	8,003	19	8,069	19
GF	11,679	27	12,361	30	12,174	29	12,174	29	12,116	29	12,361	30	12,324	29	12,095	29
LP	1,932	5	1,944	5	1,944	5	1,944	5	1,944	5	1,944	5	1,944	5	1,944	5
PP	761	2	881	2	1,402	3	1,402	3	1,502	4	1,176	3	896	2	881	2
Non-Forest	706	2	706	2	706	2	706	2	706	2	706	2	706	2	706	2
SAF	2,215	5	2,215	5	2,215	5	2,215	5	2,215	5	2,215	5	2,215	5	2,215	5
WL	1,955	5	2,161	5	2,350	6	2,350	6	2,509	6	2,229	5	2,248	5	2,161	5
WP	1,661	4	1,666	4	1681	4	1,681	4	1,707	4	1,666	4	1,666	4	1,666	4
WRC	11,757	28	11,859	28	11,832	28	11,832	28	11,832	28	11,860	28	11,860	28	11,859	28

Table III-136. Current and predicted changes to the vegetation within the Lower West Branch watershed.

	Existing		No Action		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F		Alt. G	
	Approx Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%
Structural Stage																
Seed/Sap	6,865	18	8,443	23	8,443	23	8,443	23	8,443	23	8,443	23	8,443	23	8,443	23
Pole	3,111	8	3,111	8	3,111	8	3,111	8	3,111	8	3,111	8	3,111	8	3,111	8
Immature	3,991	11	3,999	11	3,999	11	3,999	11	3,999	11	3,999	11	3,999	11	3,999	11
Mature	16,132	43	14,546	39	14,546	39	14,546	39	14,546	39	14,546	39	14,546	39	14,546	39
Moist Old Growth	5,377	15	5,377	14	5,377	14	5,377	14	5,377	14	5,377	14	5,377	14	5,377	14
Dry Old Growth	380	1	380	1	380	1	380	1	380	1	380	1	380	1	380	1
Non-Forest	1,441	4	1,441	4	1,441	4	1,441	4	1,441	4	1,441	4	1,441	4	1,441	4
Cover Type																
DF	9,480	26	7,678	21	7,164	19	7,164	19	7097	19	7,494	20	7,366	20	7,678	21
GF	8,988	24	9,942	27	9,716	26	9,716	26	9,715	26	9,895	27	9,806	26	9,942	27
LP	444	1	444	1	444	1	444	1	444	1	444	1	444	1	444	1
PP	599	2	1,263	3	1,699	5	1,699	5	1,766	5	1,435	4	1,649	4	1,263	3
Non-Forest	721	2	721	2	721	2	721	2	721	2	721	2	721	2	721	2
SAF	835	2	839	2	839	2	839	2	839	2	839	2	839	2	839	2
WL	2,252	6	2,362	6	2,623	7	2,623	7	2,623	7	2,421	7	2,416	7	2,362	6
WP	1,542	4	1,542	4	1,586	4	1,586	4	1,586	4	1,542	4	1,550	4	1,542	4
WRC	12,436	33	12,506	34	12,505	34	12,505	34	12,506	34	12,506	34	12,506	34	12,506	34

Table III-137. Current condition and predicted changes to the vegetation within the Quartz watershed.

	Existing		No Action		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F		Alt. G	
	Approx Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%	Approx. Acres	%
Structural Stage																
Seed/Sap	890	12	1,078	14	1,078	14	1,078	14	1,078	14	1,078	14	1,078	14	1,078	14
Pole	1,777	23	1,777	23	1,777	23	1,777	23	1,777	23	1,777	23	1,777	23	1,777	23
Immature	1,365	18	1,365	18	1,365	18	1,365	18	1,365	18	1,365	18	1,365	18	1,365	18
Mature	3,117	40	2,929	38	2,929	38	2,929	38	2,929	38	2,929	38	2,929	38	2,929	38
Moist Old Growth	269	3	269	4	269	4	269	4	269	4	269	4	269	4	269	4
Dry Old Growth	105	1	105	1	105	1	105	1	105	1	105	1	105	1	105	1
Non-Forest	201	3	201	3	201	3	201	3	201	3	201	3	201	3	201	3
Cover Type																
DF	1,891	25	1,746	23	1,642	21	1,642	21	1,584	21	1,746	23	1,584	21	1,746	23
GF	2,270	36	2,854	37	2,855	37	2,855	37	2,854	37	2,854	37	2,854	37	2,850	37
LP	53	1	53	1	53	1	53	1	53	1	53	1	53	1	53	1
PP	79	1	140	2	243	3	243	3	302	4	140	2	302	4	140	2
Non-Forest	198	3	198	3	198	3	198	3	198	3	198	3	198	3	198	3
SAF	46	1	46	1	46	1	46	1	46	1	46	1	46	1	46	1
WL	545	7	545	7	545	7	545	7	545	7	545	7	545	7	545	7
WP	277	4	277	4	277	4	277	4	277	4	277	4	277	4	277	4
WRC	1,865	24	1,865	24	1,865	24	1,865	24	1,865	24	1,865	24	1,865	24	1,865	24

Alternative A - No Action

Under this alternative there would be no harvest of trees killed by the Douglas-fir beetle. Stands with a high component of large Douglas-fir (greater than 14 inches in diameter) are most susceptible to attack and are likely to lose the greatest number of trees (Lockman and Gibson 1998, Flanagan 1998). Douglas-fir mortality is likely to occur in groups due to the pheromones created by the bark beetles which attract more beetles to the area. This leads to mass attacks where 60-80 percent of the large Douglas-fir can be killed (Flanagan 1998). Smaller diameter trees are also often attacked when they occur near these groups, especially in denser stands.

Since Douglas-fir beetle outbreaks typically last 3-4 years in this area and current populations of the beetle are probably at their peak, there is likely to be considerable additional mortality within the next two years. The following predictions for projected beetle-caused mortality are based on current levels of bark beetles within the watersheds, susceptibility of stands to bark beetle attack (amount of large Douglas-fir), and projected numbers of bark beetles over the next two years. However, the actual severity of future attacks can be greatly influenced by weather. Predicting exactly which stands will attract the beetles is difficult since they are strong fliers and can move several miles. Bark beetle attacks in 1998 were closely associated with areas that sustained ice and snow damage in 1996-97, so it would appear that susceptible stands close to existing infestation centers are more likely to be attacked than those further away.

There are expected to be shifts in stand species composition due to mortality caused by Douglas-fir beetles. In the majority of stands, these shifts will contribute to a continued trend toward the more shade-tolerant tree species. Although shifts will be significant in the infested stands within the analysis areas, only a small percentage of the acreage will be affected. In most stands where over 50 percent of the basal area is killed by Douglas-fir beetles, the dominant species following the beetle infestation is likely to be the species which are tolerant of shade and able to regenerate without much preparation of the seed bed for regeneration.

In those stands in which ponderosa pine or western larch are an important component, there may be an improvement in the health of the remaining trees in the stand over the short term as competition between Douglas-fir and these species is reduced. However, in the absence of further disturbance, regeneration of shrubs or shade-tolerant Douglas-fir and grand fir is likely to proliferate. This, in conjunction with high fuel

accumulations that would result as the dead Douglas-fir fall to the ground, would lead to a higher risk of fires which are so intense that the normally fire-resistant pine and larch may not survive.

There are also expected to be shifts in stand structure due to bark beetle activity. These shifts will be significant in the infested stands but will be a relatively small percentage when compared to the size of the analysis area. Losses of less than 25 percent of the basal area of a stand would not impact stand structure. Because beetles tend to kill trees in groups, it is likely that any created openings would be small and would quickly regenerate with shrubs or shade-tolerant specie. Stands in which 26-50 percent of the basal area dies may have a somewhat more open appearance once the dead trees fall to the ground. Again, created openings would likely be small and would regenerate quickly. In stands where 50-100 percent of the basal area is killed by bark beetles, the results would likely be more dramatic. Groups of trees killed by the beetles would likely join together and more of the associated small diameter Douglas-fir would likely be attacked. The entire stand would have a more open appearance. In many stands, even if 50 percent of the basal area is killed, the stand would still be dominated by the residual overstory. As the number of trees killed increases, the understory vegetation becomes more dominant and the stand structure reverts to a shrub/seedling/sapling structural stage. In most stands, groups of trees killed by Douglas-fir beetles will be less than five acres in size, but in some areas bark beetle-created openings will coalesce with root rot pockets and ice storm damage to create openings up to approximately 140 acres in size. These larger openings will be irregular in shape and retain groups of trees and scattered individual trees that have been unaffected by the bark beetle infestation.

Watson Analysis Area

Lake Face-Granite Watershed

The Lake Face-Granite Watershed is located in the lower portion of the Granite Creek Drainage and along the Priest Lake Face. A portion of this area has epidemic levels of Douglas-fir beetle with other portions being moderate to high risk of infestation but not presently infested.

As stated previously, under the No Action Alternative there is expected to be a relatively small percentage of the watershed changed in forest cover types and the cover type change will not lead to an increase in ponderosa pine, western larch or white pine. The beetle mortality disturbance, is likely to lead to regeneration of shade-tolerant species in any created openings. As can be seen in the preceding table, within the Lake Face-Granite area, there is estimated 511 acres or four percent of the area that is expected to shift from a Douglas-fir cover type to a grand fir cover type

Within the Watson analysis area there is expected to be an approximately four percent reduction in the mature/large timber structural stage as a result of the bark beetle attacks. It is estimated that approximately 454 acres of openings will be created and that these stands will regenerate to shade-tolerant species but may go through a prolonged shrub stage initially.

Lower Priest Analysis Area

For analysis purposes, the Lower Priest Analysis Area has been divided into four watershed areas: Binarch/Lamb, Upper West Branch, Lower West Branch, and Quartz.

Binarch/Lamb Watersheds

As with the Lake Face-Granite Watershed and all subsequent areas, portions of these watersheds have epidemic levels of Douglas-fir beetle attack with other portions being moderate to high risk of infestation but not presently infested.

Within the Binarch/Lamb watershed it is estimated that there are approximately 92 acres of western larch and ponderosa pine stands that may incur temporary benefits due to the mortality of Douglas-fir and reduced competition. Also, as can be seen in the preceding tables, there is expected to be a slight shift in cover types due to the Douglas-fir mortality with approximately one percent of the area or 519 acres shifting to grand fir and less than one percent or 81 acres shifting to larch from the Douglas-fir cover type.

Within the Binarch/Lamb watershed it is estimated that bark beetles will create about 869 acres of openings, or four percent of the watershed area, within the mature/large timber structural stage and move these stands into the seedling/sapling stage although they may go through an extended period when shrubs are the major component.

Upper West Branch Watershed

As stated previously, there is expected to be little change in forest cover types under the No Action Alternative that leads to an increase in seral species composition. This type of disturbance is likely to lead to regeneration of shade tolerant species in any created openings. However, within the Upper West Branch watershed it is estimated that there are approximately 120 acres of ponderosa pine and 206 acres of western larch stands (less than one percent of the area) that may incur temporary benefits due to the mortality of Douglas-fir and reduced competition.

Within this watershed it is estimated that bark beetles will shift approximately two percent or 682 acres of the Douglas-fir cover type to grand fir cover type and create about 1,565 acres of openings, or four percent of this watershed. This change will occur within the mature/large timber structural stage and move these stands into the seedling/sapling stage although they may go through an extended period when shrubs are the major component.

Lower West Branch Watershed

Within this watershed it is estimated that through mortality the bark beetles will shift approximately five percent or 1,802 acres to other forest cover types, 1,024 acres or three percent of the Douglas-fir cover type to grand fir and western redcedar, and 774 acres or two percent to ponderosa pine and western larch cover types. The ponderosa pine and western larch stands may incur temporary benefits due to the mortality of Douglas-fir and reduced competition but the regeneration that will occur in open areas will likely be grand fir, Douglas-fir and cedar.

The beetle mortality will likely create about 1,581 acres of openings (four percent of the watershed), within the mature/large timber structural stage and move these stands into the seedling/sapling stage although they may go through an extended period when shrubs are the major component.

Quartz Watershed

Within this watershed it is estimated that the bark beetle mortality will shift approximately two percent or 725 acres to other forest types. Approximately 84 acres (or one percent) of the Douglas-fir cover type will change to a grand fir cover type, 61 acres or one percent of this area from a Douglas-fir cover type to a ponderosa pine cover type. The loss of Douglas-fir trees would create about 188 acres or two percent of openings within the mature/large timber structural stage and move these stands into the seedling/sapling stage although they may go through an extended period when shrubs are the major component.

Alternative B

This alternative was developed based on field review of forested stands in which Douglas-fir beetle attacks were occurring. Refer to the tables in Appendix D for unit-by-unit descriptions of harvest prescriptions, logging systems and fuels treatments proposed under this alternative.

From a vegetation standpoint, the objective of this alternative is to harvest dead and dying trees in areas attacked by bark beetles, and to restore long-lived seral tree species such as white pine, western larch and ponderosa pine in stands where bark beetles have killed a significant portion of the basal area of the stand. This alternative would also provide for harvesting and underburning in dry site old growth ponderosa pine stands in order to maintain the old growth characteristics of these sites. These are stands which were historically open grown ponderosa pine with frequent low-intensity fires that killed very few of the large trees. Due to fire suppression, Douglas-fir trees have grown into these stands. Much of this Douglas-fir has now been attacked by beetles and is dead. As the dead trees fall, heavy fuel accumulations will take place. When fires burn in these stands now, the fires become high-intensity fires that kill most trees. By harvesting the dead Douglas-fir and understory trees that are creating a fuel ladder or are competing with the old ponderosa pine, along with underburning, these stands can be maintained as old growth. This alternative will also enhance the characteristics of several stands which will trend them toward becoming future old growth ponderosa pine. Enhancement will come by changing the species composition to allow more ponderosa pine to grow into large old trees and to reduce the chance of stand-replacing fire by eliminating the fuel ladders that exist. These are stands where beetles have killed Douglas-fir trees. By removing much of the dead Douglas-fir and thinning the remaining trees to allow growing space for the larger young ponderosa pine, these stands have a higher chance of eventually becoming dry site old growth ponderosa pine stands. In other stands where the primary objective is to selectively harvest the dead and dying trees through a salvage prescription, an opportunity exists to reduce the competition and improve the growing space for scattered ponderosa pine and western larch. In theses stands, a combination of removal of the dead and dying trees along with trees competing with the ponderosa pine and western larch will promote maintenance of these desired species, while as a whole the stands will maintain their existing structure.

Many stands would be treated by selective removal of trees killed by bark beetles (this includes trees that are attacked by beetles but may still have green crowns), blowdown, and associated trees killed or dying from root disease or other pathogens.

Harvesting and reforesting by planting would be used in stands where most trees have been killed and retention of the residual live trees is not necessary to meet visual quality, watershed and wildlife objectives. Green trees not affected by bark beetles may be removed from these stands in order to create a suitable environment for the establishment and growth of ponderosa pine, western larch and white pine trees. Logging slash and competing vegetation would be treated in these stands prior to planting with the desired species. Regeneration harvest would generally retain less than 30 percent of the trees.

Harvesting in the dry site old growth stands to maintain old growth characteristics will remove much of the dead Douglas-fir and some of the understory trees that are creating a fuel ladder. This will create open, park-like stands of ponderosa pine and Douglas-fir similar to historic conditions. In Alternative B an estimated 304 acres would be treated by selective tree removal and underburning.

This alternative will also enhance the characteristics of approximately 396 acres which could become future old growth ponderosa pine. Treatment of these stands would be accomplished by selective harvest and underburning as stated above. This treatment will likely increase the acreage of future dry site old growth.

In Alternative B and all other action alternatives, stand structures would not change substantially from the No Action Alternative. Stands that would become openings because of the Douglas-fir beetle activity are the stands that have been proposed for harvesting and regenerating by planting.

Watson Analysis Area

Lake Face-Granite Watershed

As shown in the preceding tables, Under Alternative B there would be a six percent reduction in the Douglas- fir forest cover type. This reduction will be offset by a 317-acre or three percent increase in the ponderosa pine and white pine cover types. The remaining three percent reduction will be shifted to the grand fir cover type. The increase in ponderosa pine and white pine is due to planting of these sites following harvesting and burning.

Lower Priest Analysis Area

Binarch/Lamb Watersheds

Also as shown under Alternative B, there will be a five percent reduction in the Douglas-fir cover type and an approximately three percent or 644-acre increase in ponderosa pine, western larch and white pine. The changes will be primarily due to the planting of these species following harvesting and underburning. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that were either not treated or had a selective harvest done.

Upper West Branch Watershed

In the Upper West Branch watershed under alternative B there will be a four percent reduction in the Douglas-fir cover type and an approximately three percent or 1,056-acre increase in the ponderosa pine, western larch and white pine cover types. The changes will be primarily due to the planting of these species following harvesting and underburning. A small portion of these acres will trend toward ponderosa pine due to selective removal of the dead Douglas-fir with light thinning to remove the competition. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that were either not treated or had a selective harvest done.

Lower West Branch Watershed

In the Lower West Branch watershed under alternative B there will be a six percent reduction in the Douglas-fir cover type and an approximately four percent or 1,515-acre increase in the ponderosa pine, western larch, and white pine cover types. The changes will be due to a combination of planting these species following harvesting and underburning and selective removal of the dead Douglas-fir and thinning to remove competition to the ponderosa pine. The remaining shift from Douglas-fir will be to grand fir and cedar cover types.

Quartz Watershed

In the Quartz watershed under alternative B there will be a three percent reduction in the Douglas-fir cover type and an approximately two percent or 164-acre increase in the ponderosa pine cover type. The changes will be due to a combination of planting these species following harvesting and underburning, selective removal of the dead Douglas-fir and thinning to remove competition to the ponderosa pine. The remaining shift from Douglas-fir will be to grand fir and cedar cover types.

<u>Alternative C</u>

Refer to the tables in Appendix D for unit-by-unit descriptions of harvest prescriptions, logging systems and fuels treatments proposed under this alternative.

From a vegetation standpoint, the objectives of Alternative C are the same as those for Alternative B. There is little difference in the vegetative consequences resulting from the treatments proposed in this alternative. The primary difference between alternative C and alternative B is the lack of road construction in this Alternative.

<u>Alternative D</u>

Refer to the tables in Appendix D for unit-by-unit descriptions of harvest prescriptions, logging systems and fuels treatments proposed under this alternative.

This alternative was developed similarly to Alternative B, but a more aggressive approach was used in projecting future beetle activity. Information on adjacent stands was used to assess areas where bark beetles that emerge from dead trees in 1999 and 2000 are likely to attack. These adjacent high hazard units were separated as additional harvest units which would only be harvested if the Douglas-fir beetle infests them in the future.

Many stands would be treated by selective removal of trees killed by bark beetles (this includes trees that are attacked by beetles but may still have green crowns), blowdown and associated trees killed or dying from root disease or other pathogens.

Harvesting and reforesting by planting would be used in stands where most trees have been killed and retention of the residual live trees is not necessary to meet visual quality, watershed and wildlife objectives. Green trees not affected by bark beetles may be removed from these stands in order to create a suitable environment for the establishment and growth of ponderosa pine, western larch and white pine trees. Logging slash and competing vegetation would be treated in these stands prior to planting with the desired species. Regeneration harvest would generally retain less than 30 percent of the trees. Harvesting in the dry site old growth stands to maintain old growth characteristics will remove much of the dead Douglas-fir and some of the understory trees that are creating a fuel ladder. This will create open, park-like stands of ponderosa pine and Douglas-fir, similar to historic conditions. Under this alternative, approximately 338 acres would be treated by selective tree removal and underburning.

This alternative will also enhance the characteristics of approximately 408 acres which could become future old growth ponderosa pine. Treatment of these stands would be accomplished by selective harvest and underburning as stated above. This treatment will likely increase the acreage of future dry site old growth.

Watson Analysis Area

Lake Face-Granite Watershed

As shown in the preceding tables, under Alternative D there would be a seven percent reduction in the Douglas-fir forest cover type. This reduction will be offset by a 463-acre or four percent increase in the ponderosa pine and white pine cover types. The remaining three percent reduction will be shifted to the grand fir cover types. The increase in the ponderosa pine and white pine is due to planting of these sites following harvesting and burning.

Lower Priest Analysis Area

Binarch/Lamb Watersheds

Also as shown under Alternative D, there will be a five percent reduction in the Douglas-fir cover type and an approximately three percent or 654-acre increase in ponderosa pine, western larch and white pine. The changes will be primarily due to the planting of these species following harvesting and underburning. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that either were not treated or had a selective harvest done.

Upper West Branch Watershed

In the Upper West Branch watershed, under alternative D there will be a five percent reduction in the Douglas-fir cover type and an approximately three percent or 1,341-acre increase in the ponderosa pine, western larch and white pine cover types. The changes will be primarily due to the planting of these species following harvesting and underburning. A small portion of these acres will trend toward ponderosa pine due to selective removal of the dead Douglas-fir with light thinning to remove some competing trees. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that either were not treated or had a selective harvest done.

Lower West Branch Watershed

In the Lower West Branch watershed, under alternative D there will be a six percent reduction in the Douglas-fir cover type and an approximately four percent or 1,582-acre increase in the ponderosa pine, western larch and white pine cover types. The changes will be due to a combination of planting these species following harvesting and underburning and selective removal of the dead Douglas fir and thinning to remove competition to the ponderosa pine. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that either were not treated or had a selective harvest done.

Quartz Watershed

In the Quartz watershed, under alternative D there will be a four percent reduction in the Douglas-fir cover type and an approximately three percent or 223-acre increase in the ponderosa pine cover type. The changes will be due to a combination of planting these species following harvesting and underburning and selective removal of the dead Douglas-fir with thinning to remove competition to the ponderosa pine. The remaining shift from Douglas-fir will be to the grand fir cover type and will be in areas that either were not treated or had a selective harvest done.

<u>Alternative E</u>

Refer to the tables in Appendix D for unit-by-unit descriptions of harvest prescriptions, logging systems and fuels treatments proposed under this alternative.

The objective of this alternative is to harvest only dead and dying trees in areas currently impacted by Douglas-fir beetles. No additional green trees would be harvested to create suitable conditions for planting. No treatments to maintain dry site old growth ponderosa pine stands would occur under this alternative. Underburning and planting of seral species could be done where bark beetle mortality allowed for a successful burning prescription and created adequate canopy openings for successful establishment of shade intolerant species. This alternative was developed based on Alternative B. On some sites, openings created by bark beetles would be allowed to regenerate naturally. There would be no site preparation in these stands, so shade tolerant species are likely to dominate this natural regeneration.

Watson Analysis Area

Lake Face-Granite Watershed

As shown in the preceding tables, Under Alternative E there would be a six percent reduction in the Douglas-fir forest cover type. This reduction will be offset by a 214-acre or two percent increase in the ponderosa pine and white pine cover types. The remaining four percent reduction will be shifted to the grand fir cover types. The increase in the ponderosa pine and white pine is due to planting of these sites following harvesting and burning.

Lower Priest Analysis Area

Binarch/Lamb Watersheds

Also as shown under Alternative E, there will be a four percent reduction in the Douglas-fir cover type and an approximately two percent or 352-acre increase in ponderosa pine, western larch and white pine. The changes will be primarily due to the planting of these species following harvesting and underburning. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that either were not treated or had a selective harvest done.

Upper West Branch Watershed

In the Upper West Branch watershed under alternative E there will be a four percent reduction in the Douglas-fir cover type and an approximately two percent or 694-acre increase in the ponderosa pine, western larch and white pine cover types. The changes will be primarily due to the planting of these species following harvesting and underburning. A small portion of these acres will trend toward ponderosa pine due to selective removal of the dead Douglas fir. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that either were not treated or had a selective harvest done. Dry site old growth ponderosa pine would continue to be at risk of being killed by fire. The Douglas-fir that have grown in on the sites since fire suppression would continue to compete with the old growth trees for sunlight, water and nutrients. A decline in vigor of the old growth trees will continue at a more rapid rate than under historic lower stocking levels of trees.

Lower West Branch Watershed

In the Lower West Branch watershed under alternative E there will be a five percent reduction in the Douglas-fir cover type and an approximately three percent or 1,099-acre increase in the ponderosa pine, western larch and white pine cover types. The changes will be due to a combination of planting these species following harvesting and underburning and selective removal of the dead Douglas-fir. Dry site old growth ponderosa pine would continue to be at risk of being killed by fire. The Douglas-fir that have grown in on the sites since fire suppression would continue to compete with the old growth trees for sunlight, water and nutrients. A decline in vigor of the old growth trees will continue at a more rapid rate than under historic lower stocking levels of trees.

Quartz Watershed

In the Quartz watershed under alternative E there will be a two percent reduction in the Douglas-fir cover type, an approximately one percent or 61-acre increase in the ponderosa pine cover type, and a one percent increase in the grand fir cover type. The changes will be due to a combination of planting these species following harvesting and underburning and selective removal of the dead Douglas-fir caused by the beetle activity. Dry site old growth ponderosa pine would continue to be at risk of being killed by fire. The Douglas-fir that have grown in on the sites since fire suppression would continue to compete with the old

growth trees for sunlight, water and nutrients. A decline in vigor of the old growth trees will continue at a more rapid rate than under historic lower stocking levels of trees.

Alternative F

Refer to the tables in Appendix D for unit-by-unit descriptions of harvest prescriptions, logging systems and fuels treatments proposed under this alternative.

The objective of this alternative is to aggressively treat high fuel levels that would be created by heavy Douglas-fir beetle mortality in areas in close proximity to private lands and, in particular, in the urban-interface areas. This is to reduce the risk of high intensity fires causing damage to private lands and also to create some buffers to help reduce the risk of spread of fire from private lands to National Forest lands.

This alternative was developed from Alternative B. Analysis areas that had only small parcels of private land and low levels of beetle activity were dropped from this alternative.

Where underburning is used to treat fuels in selective harvest units, there is some concern that scorching of large Douglas-fir within these stands could make them attractive to additional bark beetle attacks. Delaying underburning until the current outbreak has subsided should minimize this risk.

Watson Analysis Area

Lake Face-Granite Watershed

As shown in the preceding tables, Under Alternative F there would be a five percent reduction in the Douglas-fir forest cover type. This reduction will be offset by a 215-acre or two percent increase in the ponderosa pine and white pine cover types. The remaining three percent reduction will be shifted to the grand fir cover types. The increase in the ponderosa pine and white pine is due to planting of these sites following harvesting and burning.

Lower Priest Analysis Area

Binarch/Lamb Watersheds

Also as shown under Alternative F, there will be a five percent reduction in the Douglas-fir cover type and an approximately two percent or 437-acre increase in ponderosa pine, western larch and white pine. The changes will be primarily due to the planting of these species following harvesting and underburning. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that either were not treated or had a selective harvest done.

Upper West Branch Watershed

In the Upper West Branch watershed under Alternative F there will be a three percent reduction in the Douglas-fir cover type and an approximately one percent or 433-acre increase in the ponderosa pine, western larch and white pine cover types. The changes will be primarily due to the planting of these species following harvesting and underburning. A small portion of these acres will trend toward ponderosa pine due to selective removal of the dead Douglas-fir. The remaining shift from Douglas-fir will be to grand fir and western redcedar cover types and will be in areas that either were not treated or had a selective harvest done.

Lower West Branch Watershed

In the Lower West Branch watershed under alternative F there will be a six percent reduction in the Douglas-fir cover type and an approximately three percent or 1,222-acre increase in the ponderosa pine, western larch, and white pine cover types. The changes will be due to a combination of planting these species following harvesting and underburning and selective removal of the dead Douglas-fir.

Quartz Watershed

In the Quartz watershed under alternative F there will be a four percent reduction in the Douglas-fir cover type and an approximately three percent or 223-acre increase in the ponderosa pine cover type. The changes will be due to a combination of planting these species following harvesting and underburning and selective removal of the dead Douglas-fir caused by the beetle activity. The remaining shift from Douglas-fir will be to the grand fir cover type.

Alternative G

Refer to the tables in Appendix D for unit-by-unit descriptions of fuels treatments proposed under this alternative.

Alternative G was developed in response to public comment requesting the agency consider an alternative that completed restoration activities without the use of commercial timber harvest. The two primary activities considered were road work for aquatic and wildlife improvements and the use of prescribed fire and non-commercial vegetation treatments to accomplish the vegetation restoration goals.

Alternatives D and F were used as a base to select potential watershed and vegetation restoration and fuels reduction treatments proposed in this alternative. Vegetation treatments are included where prescribed fire and other non-commercial treatments could feasibly be used to treat excess fuel loadings and trend those forest stands toward desired conditions. Only those acres were included where treatments could meet these objectives. Manual thinning and pruning of sub-merchantable timber (<7 inch diameter) as well as some felling and lopping of larger timber would be required on some of these acres to meet silvicultural objectives.

Prescribed burning and some mechanical treatments would be used to reduce hazardous fuels, although only a limited amount of fuels created by the current bark beetle epidemic could be treated at this time.

Approximately 366 acres would be proposed for treatment as described above. This treatment is not projected to change present species composition or overall structure of any of the treated stands. Some fuels reduction is expected for existing downed fuels, and a small percentage of the stand will be lost to mortality through felling and burning.

Only a stand replacement fire followed by replanting of desired species would accomplish a change in composition and structure in one entry with the use of fire only. The treatments proposed under this alternative would have to be repeated several times over a period of years to achieve the same objective.

Watson Analysis Area

Lake Face-Granite Watershed

No treatment is proposed in this watershed. Direct and Indirect effects will be the same as described in the No Action Alternative A.

Lower Priest Analysis Area

Binarch/Lamb Watersheds

No treatment is proposed in this watershed. Direct and Indirect effects will be the same as described in the No Action Alternative A.

Upper West Branch Watershed

Only three acres are scheduled for treatment in this watershed. A slight reduction in fuel loadings can be expected following treatment, but no change in overall species composition or stand structure is expected. For the remainder of the area the direct and indirect effects will be the same as described in the No Action Alternative A.

Lower West Branch Watershed

Approximately 304 acres are scheduled for treatment in this watershed. A slight reduction in fuel loadings can be expected following treatment, but no change in overall species composition or stand structure is expected. For the remainder of the area the direct and indirect effects will be the same as described in the No Action Alternative A.

Quartz Watershed

Approximately 58 acres are scheduled for treatment in this watershed. A slight reduction in fuel loadings can be expected following treatment but no change in overall species composition or stand structure is expected. For the remainder of the area, the direct and indirect effects will be the same as described in the No Action Alternative A.

Cumulative Effects at the Priest Lake Project Area Scale

Table 111-138. Total approximate acres and percent gain or loss (+/-) of desired species, by alternative.

Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alt. F	Alt. G
1,258 acres	3,695 acres	3,695 acres	4,252 acres +	2,431 acres	2,530 acres	1,258 acre
+ 1.0%	+ 3.0%	+ 3.0%	+ 3.5%	+1.9%	+2.1%	+1.0%

The cumulative effects by watershed of past and present activities, including fire suppression, disease, and vegetative growth are reflected in the tables in each of the analysis areas above, under the columns labeled, "Existing Acres". These tables show that the existing condition within all affected watersheds has trended toward forest compositions and stand structures that are much different from historic conditions, as displayed above in the comparisons of current and historic forest cover types, stand structures and distribution of habitat type groups. The effects of all past and present activities have trended these watershed landscapes toward less old growth forest, especially on dry habitat types, and toward more medium/immature and large/mature forest structures (Historic 24% Old Growth--Existing 4-22% Old Growth, and Historic 43% Medium/Immature & Large/Mature forest structure and Existing 49-65%). These activities have changed the forest compositions from watersheds dominated by western white pine, western larch and, on the dry habitats, ponderosa pine to those dominated by Douglas-fir, grand fir, cedar and hemlock.

Effects Common to All Alternatives

As shown in previous summaries by watershed and displayed in this cumulative effects summary by alternative, all alternatives display a trend toward restoration of the desired seral species ponderosa pine, western larch and white pine. In all alternatives, in stands in which ponderosa pine and western larch are an important component, there would be an improvement in stand conditions over the short term as

competition between Douglas-fir and these species is reduced by mortality of the Douglas fir. However, overall forest stand structure would not change.

Cumulative Effects on Private Lands

An estimated 17,193 acres (or 12 percent) of the Priest Lake area are under private ownership. Information on private lands within the project area is limited. Most information has been obtained from aerial photos, satellite imagery and personal knowledge. Some information on past and planned harvest and road building has been gathered from industrial owners and on state lands, but generally no specific information is available for non-industrial private landowners.

In general, private lands are on lower elevations and receive less moisture, although there is industrial timberland in some of the higher elevations. Some past harvests have been regeneration harvests that have created some openings in the forest canopy and have resulted in regeneration of seral species. But many existing openings, particularly in the lowlands, are a result of land clearing for homes and pastures. Other private lands are natural openings or meadow lands acquired through homesteading or other means.

More often, timber harvests on private lands tend to be partial cuts that remove trees of the highest economic value (usually the largest) and typically removes any old forest structure. Natural regeneration is relied on to fill most created openings. This tends to favor shade tolerant Douglas-fir and grand fir over early seral species such as pine and larch. Private lands are expected to be managed similar to the past, with some lands trending toward the desired species compositions, as some land managers are managing for these species, but many private land owners are not making the investments to manage this direction. No significant increase in the late mature structures or old growth are expected on private lands

Fawning and calving habitat for ungulates has been reduced on private lands, as has good winter range. Habitat for old growth dependant species is practically non-existent on private land and probably will never return to levels characteristic of the inherent disturbance regime for the landscape as a whole. In general, snags are few on private land, particularly in riparian areas close to roads.

Since private lands often include residences and other developments, fire will continue to be aggressively suppressed, although the potential for increased ignitions continues to rise as human use increases.

Although it is impossible to predict exactly what will happen on private lands, it is estimated that private lands will be managed similar to past management practices, and that historic ranges of variability in vegetation will not be returned on a landscape scale.

Foreseeable Actions

A continuation of harvest proposals on federal lands is planned to trend more acres toward desired stand structures and species composition as described in this analysis. The foreseeable actions on National Forest lands, described in Appendix E, are estimated to trend approximately 250 acres or less than 0.2 percent of the project area toward these desired stand conditions. In areas not trended in this direction, a continued increase in grand fir, cedar, hemlock, and in some situations Douglas-fir will result and stand density levels will increase. Competition for light, nutrients and water will be strong in these dense conditions, causing stress and then disturbance. Without continued management to promote the species of western larch, white pine and ponderosa pine, these species will continue to decline in these watersheds and across the Priest River subbasin. Depending on the level of disturbance and management, an increase or decrease from current condition of these species may result.

Within the project area, a Douglas-fir Beetle Pheromone Study project (USDA 1999) will take place at several locations. Anti-aggregation pheromones (MCH) will be used to determine if the chemicals are effective in preventing or reducing beetle-caused mortality over the study areas. Aggregation pheromones will be used

to compare the effectiveness of different types of beetle traps and different strengths of pheromones and to determine the optimal number of traps. A study will also be done to determine if mass trapping can effectively influence beetle distribution and reduce tree mortality. While these studies may have some local measurable reductions in beetle populations or in redirecting beetle-caused mortality, they are not expected to have measurable effects on the progression of intensity of the epidemic. The localized effects are addressed in the Categorical Exclusion for the Pheromone Study project. A copy of the Decision Memo is in the project file.

Effects Common to All Action Alternatives

In all watersheds where alternative actions are described, there is expected to be beetle mortality that has either not been found or that will occur outside of the presently infested or areas projected to be infested.

All action alternatives would trend treated areas toward a desired species restoration, but at different levels. Throughout the watersheds affected by the Douglas-fir beetle and the alternative actions analyzed, there would be a 2 to 4 percent increase in acres dominated by the desired species with a corresponding decrease in acres dominated primarily by Douglas-fir. On the dry habitat types within these watersheds, this increase would be a considerably greater percentage. Considering the Priest River subbasin as a larger geographic area, this trend would occur on a very small portion of the landscape, but the trend would still be in the desired direction. The future stands, managed with historically adapted, potentially long-lived seral species at density levels that allow for sustained growth, would provide the greatest options for future managers and the public. Stands managed with these characteristics are more adaptable to change and disturbance and thus more sustainable over the long term.

Effects Common to Alternatives B, C, D and F

In alternatives B, C, D and F, the cumulative effects on dry site old growth ponderosa pine would likely be a long-term increase in this structure.

Alternative A

As the Douglas-fir dies, a temporary increase in growing space for existing ponderosa pine and western larch will occur. This is expected to take place on approximately 1,258 acres - a one percent change. Under this alternative, the openings created by the dying Douglas-fir would primarily be reforested by Douglas-fir and grand fir seedlings. No long-term increase in western larch, white pine or ponderosa pine would be seen. Future wildfires would be of a higher intensity, due to heavy fuel loading from the dead Douglas-fir. It is estimated that approximately two to four percent (with an average of four percent) of the area in the affected watersheds would change from the large/mature forest structures to the shrub/seedling structures. This structure change would not trend the shrub/seedling structures beyond historic ranges. With continuing Douglas-fir mortality, no long-term increase in old growth structure would be expected. In addition, the risk of loss of historic dry site old growth from wildfire may increase as dead trees contribute to accumulation of heavy fuels.

Historically, as discussed above in Affected Environment, ponderosa pine, white pine and western larch comprised approximately 63 percent of the forest cover type in these watershed landscapes. Under the No Action alternative, these forest cover types would be approximately 9-14 percent in all watersheds except for Binarch/Lamb, which is estimated at 30 percent. One result of this change in forest species composition would be a forest much more fire-intolerant and prone to insect and disease infestation. Ponderosa pine, western larch and white pine are historically longer-lived species than Douglas-fir in this area, and are more adapted to disturbance stresses. In the cover types resulting from implementation of the No Action alternative, most of the Douglas-fir would die before reaching old growth, and the trend would be a reduced level of old growth from historic conditions.

Alternative B

The cumulative effects of alternative B would be to trend an estimated 3,695 acres or three percent of these watersheds toward restoring of the species of white pine, western larch and ponderosa pine.

In alternative B, there are expected to be an estimated 304 acres of dry site old growth stands with maintenance of these old growth characteristics prescribed. By harvesting the dead Douglas-fir and understory trees that are creating a fuel ladder or are competing with the old ponderosa pine, along with underburning, these stands could likely be maintained as old growth.

This alternative would also enhance the characteristics of several stands which would likely become future old growth ponderosa pine. Enhancement entails changing the species composition to allow more ponderosa pine to grow into large old trees and to reduce the chance of stand-replacing fire by eliminating existing fuel ladders. In these stands, beetles have killed many Douglas-fir trees. By removing much of the dead Douglas-fir and thinning the remaining trees to allow growing space for the larger young ponderosa pine, the stands have a higher chance of eventually becoming dry site old growth ponderosa pine stands. Alternative B would, through selective harvest and underburning, achieve this objective on an estimated 396 acres of these dry site stands.

Alternative C

For vegetation, the cumulative effects of alternative C are the same as Alternative B.

Alternative D

The cumulative effects of alternative D are similar to alternative B, except that Alternative D displays an acreage that would be trended toward the desired species "if all units estimated to become infested with the Douglas-fir beetle actually become infested". As described earlier, only those areas that are infested would be harvested under this alternative or any action alternative. In alternative D an estimated 4,252 acres would be trended toward restoration of western white pine, ponderosa pine and western larch. Under this alternative, maintenance of old growth characteristics would likely take place on an estimated 338 acres of dry site old growth ponderosa pine stands; an estimated 408 acres would be treated to enhance the development of future old growth characteristics in stands which do not presently meet old growth minimum criteria.

Alternative E

The cumulative effects of alternative E would be to trend an estimated 2,431 acres or 1.9 percent of these watersheds toward restoring of the species of white pine, western larch and ponderosa pine. Only dead and dying trees (with an insignificant number of green trees in skid trails and skyline corridors) would be proposed for removal under this alternative, so that site preparation for planting of desired species would not be able to take place on many of the stands that would be treated under alternative B. No selective harvest treatment of dry site old growth ponderosa pine stands would occur in this alternative.

Alternative F

The cumulative effects of alternative F would be to trend an estimated 2,530 acres or 2.1 percent of these watersheds toward restoring of the species of white pine, western larch and ponderosa pine. With this alternative, treatment would be limited to those infestations near private lands.

Under this alternative, maintenance of old growth characteristics would likely take place on an estimated 340 acres of dry site old growth ponderosa pine stands; an estimated 390 acres would be treated to enhance the development of future old growth characteristics in stands which do not presently meet old growth criteria.

Alternative G

As the Douglas-fir dies, a temporary increase in growing space for existing ponderosa pine and western larch will occur. This is expected to take place on approximately 1,258 acres - a one percent change. Under this alternative, the openings created by the dying Douglas-fir would primarily be reforested by Douglas-fir and grand fir seedlings. No long-term increase in western larch, white pine or ponderosa pine would occur.

Alternative G proposes to treat a portion of the beetle-infested areas without timber harvest. Under this alternative, manual thinning and pruning of sub-merchantable timber, as well as some felling and lopping of larger timber, would take place to provide a fuel bed for burning under prescribed conditions. This alternative would be one step in a trend toward establishment of the desired species of western larch and ponderosa pine, but the treatment at this time would not restore these desired species. Alternative G would include underburning within approximately 195 acres of infested dry-site old growth stands. The cumulative effect of treatments in this alternative would not trend any acres to the desired species composition at this time.

Effects of Opportunities

Timber Stand Improvement (Precommercial Thinning) - Thinning redistributes growth and trends stand species composition for the future. Thinning would favor healthy trees of desired species adapted to the various habitat types. The seral species of ponderosa pine, western larch, and white pine would be favored when present on the appropriate growing sites. The effects of this thinning will be to trend toward stocking levels which would allow for continued tree growth, by favoring the healthiest trees to remain on site and allowing for nutrients critical to the trees growth and defense mechanisms to be redistributed to uncut trees. The effects of healthy growing trees that are adaptable to disturbance on these sites will be to reduce the risk of epidemic levels of insect and disease infection, and allow managers a variety of options for future vegetation management.

Additional Watershed and Wildlife Restoration - Restoration opportunities that may be accomplished by road obliteration will start several acres of non-forest land on a slow trend toward becoming reforested. These sites will most likely be initially revegetated by grasses, forbs and shrubs, with most sites seeing an eventual recovery to timber of various species depending on site, seed or seedling availability and soil productivity. Long-term effects for vegetation will be more acres of forest vegetation. Access for management of adjacent vegetation a may be temporarily limited or physically challenging by removal of some roads.

Noxious Weed Treatment and Monitoring - Noxious weed treatment and monitoring conducted under the guidelines established under the Priest Lake Noxious Weed Control Project EIS (USDA 1997) would have no effect on forest tree vegetation.

Consistency With the Forest Plan and Other Applicable Regulatory Direction

All Alternatives are consistent with Idaho Panhandle National Forests Forest Plan direction. The specific Standards, with their location in the Forest Plan, are referenced below in parentheses.

Both even-aged and uneven-aged silvicultural systems were considered for areas proposed for harvest. On the Priest Lake Ranger District, it was determined that both systems were appropriate where regeneration harvests were proposed (Timber Standard 1, page II-31).

In most stands proposed for harvest, only dead and dying trees would be designated for removal. This is also consistent with Forest Plan direction that stands which are "substantially damaged by fire, windthrow,

insect or disease attack, or other catastrophe may be harvested where the salvage is consistent with silvicultural and environmental standards" (Timber Standard 2, page II-32).

Regeneration harvests are proposed for stands in which the majority of the trees have been killed. Site preparation and fuels reduction activities are planned to provide appropriate sites for planting. Following site preparation, usually underburning, regenerated stands would be planted with seral species (white pine, larch, and ponderosa pine) to promote stand structures and species composition which reduce susceptibility to insect and disease damage. This is consistent with Forest Plan direction that "reforestation will feature seral tree species". All stands proposed for regeneration harvests are on lands suitable for timber production and can be adequately restocked within five years of the final harvest. As directed by the Forest Plan, stands would be regenerated with trees from seed that is well-adapted to the specific site conditions, and would be regenerated with a variety of species (Timber Standard 4 and 5, page II-32).

Created openings would be blended to the form of the natural terrain as much as practicable. The Forest Plan states that creation of openings larger than 40 acres must conform with current Regional guidelines regarding public notification, environmental analysis and approval. The Draft EIS informed the public that openings of greater than 40 acres would be created. In accordance with the Regional guide and NFMA, the 40-acre limitation does not apply to areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm. Openings would no longer be considered openings when both vegetation and watershed conditions meet management objectives established for the management area. Openings on adjacent private lands were considered in the analysis of effects of the alternatives (Timber Standards 7 and 8, page II-32).

Site specific silvicultural prescriptions are compatible with management area goals, and preferred species management has considered both biological and economic criteria (Timber Standard 9, page II-32). Silvicultural practices including harvest, site preparation and planting with seral species are designed to reduce the perpetuation of pest problems. Reduction of the current beetle epidemic was not considered possible with either silvicultural practices or direct control methods (Forest Protection Standards 1 and 2, pages II-37 and II-38).

Management of competing understory vegetation would be accomplished, where necessary, as a consequence of fuels reduction/site preparation treatments (Forest Protection Standard 3, page II-38).

THREATENED, ENDANGERED AND SENSITIVE (TES) PLANTS

CHANGES BETWEEN THE DRAFT AND FINAL EIS

Several changes have been made between the Draft EIS and Final EIS. For Threatened, Endangered and Sensitive plants, the most significant change has been that, since the release of the Draft EIS, a new Regional Forester's sensitive species list was signed (March 10, 1999). In addition, the IPNFs have developed a list of Forest species of concern (see definition below). Prior to the signing of the new list, analysis of sensitive plants addressed species on both the old and proposed lists. For the Final EIS, species which do not appear on the new (March 1999) list and which are not recognized as Forest species of concern are not addressed. Species which were not on the proposed sensitive plant list but which were late additions to the new list are addressed in the Final EIS.

Changes in some harvest prescriptions and harvest acres have precipitated changes in some of the acreages in the tables. The changes were minor and did not result in a difference in the determination of effects.

Alternatives F and G were added to the Final EIS; their direct, indirect and cumulative effects on sensitive plants were analyzed.

The Biological Assessment for Threatened and Endangered species is now in the project file for the Final EIS. Accordingly, Threatened and Endangered plant species have been addressed in this section.

REGULATORY FRAMEWORK

Federal legislation, regulations, policy and direction require protection of species and population viability, evaluation and planning process consideration of Threatened, Endangered and other rare (Forest Service Sensitive) plant species. The regulatory framework for TES plants includes the Endangered Species Act (1973) as amended; the National Forest Management Act (1976); the National Environmental Policy Act (1969); Forest Service Manual (2672.1-2672.43); Idaho Panhandle National Forests (IPNF) Forest Plan (1987); and direction from the Regional Watershed, Wildlife, Fisheries and Rare Plants (WWFRP) program and Washington Office.

AFFECTED ENVIRONMENT

Threatened and Endangered Plant Species

There are no federally listed Endangered plant species suspected to occur in the Idaho Panhandle National Forests.

A Threatened species, as determined by the US Fish and Wildlife Service, is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Currently, the US Fish and Wildlife Service (USDI 1999) indicates two species listed as threatened for Idaho Panhandle National Forests (IPNF), **water howellia** (*Howellia aquatilis*) and **Ute ladies'-tresses** (*Spiranthes diluvialis*).

Potentially suitable habitat for **water howellia** is scattered over portions of the analysis area in shallow ponds and adjacent to the southern end of the analysis area in old oxbows along the lower Priest River. Additional suitable habitat likely occurs on lands in the ecosystem under other ownership. Botanists from the US Forest Service, State of Idaho Department of Lands and Idaho Fish and Game Conservation Data Center have conducted floristic surveys of many wetlands in the ecosystem over the past decade, but have not located any occurrences of the species. An 1892 sighting approximately 40 miles south of the Decision Area has not been relocated and is presumed to have been extirpated (Shelly and Moseley 1988).

The recent Douglas-fir beetle outbreak has not affected suitable habitat for water howellia. There is no proposed treatment within or adjacent to potentially suitable habitat for water howellia. It was determined that implementation of any alternative would have no effect on water howellia or its habitat.

In north Idaho, the steppe zone of the Palouse Prairie, Rathdrum Prairie and canyon grasslands are considered potentially suitable habitat for **Ute ladies'-tresses** (Moseley 1998). Montane coniferous forest, subalpine coniferous forest and alpine zones are not likely places to find Ute ladies'-tresses (Moseley 1998). Its potential habitat in the Priest, Pend Oreille and Kootenai River subbasins is considered restricted to low-elevation, low-gradient streams and rivers and open, broad alluvial valleys dominated by mixed conifer/cottonwood, shrub and wet meadow grass and forb communities (Mousseaux 1998). Most such habitat in the Priest River ecosystem is under private or other ownership.

Although lower elevation riparian habitats within the analysis area may possess some geophysical characteristics considered to represent high potential habitat for the species, these habitats are generally characterized by cold, moist boreal plant communities which have low potential to support the species. In addition, as elevation within the analysis area increases, most streams generally become moderate- to high-gradient. They are conifer-dominated, with narrow riparian influence and abrupt transition from riparian to upland plant communities. Such conditions generally hold low potential to support Ute ladies'-tresses (Mousseaux 1998).

The recent Douglas-fir beetle outbreak has not affected suitable habitat for Ute ladies'-tresses. There are no proposed harvest or project-related activities in or adjacent to potentially suitable habitat for Ute ladies'-tresses. It was determined that implementation of any alternative would have no effect on Ute ladies'-tresses or its habitat.

A Biological Assessment addressing both species is included in the project file.

Sensitive Plant Species and Forest Species of Concern

Sensitive species are determined by the Regional Forester as those species for which population viability is a concern, as indicated by a current or predicted downward trend in population numbers or habitat capability which would reduce the species' existing distribution. The Northern Regional Forester's sensitive species list for the IPNF contains 63 plant species. Certain species are known to occur only within certain subbasins, while others are known throughout the IPNF. Forty-eight species are known or suspected to occur in the Kaniksu portion of the IPNF.

In addition, several "Forest species of concern" (USDA 1997) are addressed in this analysis. A Forest species of concern is not at risk on a rangewide, region-wide or state level, but may be imperiled within a planning area, such as a National Forest. Forest species of concern are addressed in effects analysis to provide for maintenance of populations as directed in NFMA. Biological Evaluations are not required to address Forest species of concern. A discussion of Forest species of concern is included with the discussion of sensitive species. The list of sensitive species and Forest species of concern is included in Appendix B.

Sensitive plant species and Forest species of concern may be assigned to one or more rare plant guilds. These guilds are artificial assemblages based on similar habitat requirements of two or more rare plant species, and are used for analysis. Rare plant guilds in which most IPNF sensitive plant species occur include the following: aquatic, deciduous riparian, peatland, wet forest, moist forest, dry forest, cold forest and subalpine. Within these guilds, microsites such as small rock seeps and springs can support certain sensitive plants; these microsites are not identifiable at a coarse scale. Larger rock cliffs are often visible on aerial photographs, or can be inferred from topographical maps. See Appendix B for specific guild descriptions.

This assessment describes the extent of all rare plant guilds in the analysis areas. Discussion of effects will focus on rare plant guild habitats most likely to be affected by the recent Douglas-fir beetle infestation.

Assessment of sensitive species, Forest species of concern and suitable habitat occurrence was accomplished through review of Priest Lake Ranger District Sensitive Plant Records, Idaho Department of Fish and Game Conservation Data Center (ICDC) Element Occurrence Records, National Wetlands Inventory maps, timber stand examination records, aerial photographs and topographical maps, previous sensitive plant surveys, personal knowledge and professional judgement of the Zone and Forest Botanists.

Previously documented occurrences of sensitive species and Forest species of concern within the nine analysis areas (ICDC 1998) indicate that these species have a high probability of occupying unsurveyed highly suitable habitat.

The large majority of rare plant occurrences in the Priest Lake (IPNF) portion of the proposed project are in the wet forest and peatland guilds. The moist forest and cold forest guilds are also represented, with one species occurring in deciduous riparian habitat. Table B-4 in Appendix B displays documented species within the analysis areas.

Six sensitive plant species and two Forest species of concern documented within the analysis areas have the highest likelihood of occurring where harvest and/or project-related activities are proposed. Unsurveyed highly suitable habitat for these species is presumed to harbor additional occurrences.

Sensitive Species

Moonworts (*Botrychium lanceolatum, B. minganense, B. montanum, B. paradoxum*): Moonworts are seedless vascular plants which reproduce from spores and underground rhizomes. These four rare moonworts generally occur on shallow slopes in mature, wet forest habitat with significant canopy cover (75 percent or greater) and well-developed soil mycorrhizae[1]. It is believed that mycorrhizal relationships are critical to the survival of moonwort populations. Because several moonwort species are often found together, *Botrychium pedunculosum, B. ascendens, B. simplex, B. crenulatum* and *B. pinnatum* may also occur, although they have never been documented in the analysis areas. *B. minganese, B. lanceolatum, B. pinnatum, B. paradoxum* and *B. simplex* have occasionally been found in moist forest habitats and even in highly disturbed areas such as road turnouts (ICDC 1998).

Ground pine (*Lycopodium dendroideum*): Ground pine is a terrestrial clubmoss which reproduces both by rhizomes and spores. Ground pine is a mid-seral species that declines in very old stands (Williams 1990). It occurs mostly in lower elevation cold forest habitats characterized by subalpine fir and Engelmann spruce, and is usually closely associated with valley bottom topography and the margins of wet meadows or streams. Ground pine has also been documented in moist forest habitat slightly upland of valley bottoms (ICDC 1998).

Deerfern (*Blechnum spicant*): This rare fern is a coastal disjunct sensitive species - it is quite common west of the Cascades mountains in Washington and Oregon. It occurs in north Idaho where climate and moisture regimes are similar to those in western Washington and Oregon. Consequently, the preferred habitat of deerfern is low to mid-elevation mature to old growth, wet forest. It is occasionally found in old road prisms and immature moist forest habitats in disturbed mineral soil.

Other rare species within the wet and moist forest guilds have a low likelihood of occurring in proposed treatment areas because of narrow habitat requirements or because they occur in habitats not known within the analysis areas. **Northern beechfern** occurs within the analysis areas, but is closely associated with late-seral to old growth wet forest guild habitats. Habitats which might harbor this species experienced little to no recent bark beetle activity. No harvest or project-related activities are proposed in suitable habitat for this species.

Krushea and **Braun's holly fern** occur in old growth and ancient wet cedar forest north of the project area, and are not suspected to occur within the project area. Two sensitive moss species of wet forest habitats may occur in the project area, but are not likely to occur within beetle-affected areas. Suitable habitat for **green bug-on-a-stick moss**

[1]*Mycorrhizae are symbiotic relationships between soil fungi and the roots of certain plant species. While their ecology is poorly understood (Ahlenslager and Swartz 1997), it is thought that mycorrhizal relationships enhance nutrient uptake by the host plants.*

(*Buxbaumia viridis*) consists of densely shaded, mid- to late seral, wet forest habitats on rotting logs. **Clear moss** (*Hookeria lucens*) is known from wet cedar forests in British Columbia and the Clearwater and Nez Perce National Forests in Idaho (Moseley and Pitner 1996).

One sensitive species, **maidenhair spleenwort** (*Asplenium trichomanes*), which *may* occur in the project area where harvest and/or project-related activities are proposed, is adapted to microsites of rock seeps and springs surrounded by moist to wet forest habitats. The nearest known occurrence of this species is approximately 25 miles northeast of the project area, in small rock seeps just above the Kootenai River valley. That occurrence is the only known population in the state of Idaho.

No occurrences of the only dry forest guild species, **least bladdery milkvetch** (*Astragalus microcystis*), have been identified in the Priest Lake Ranger District to date, and actual likelihood of its occurrence there is low. The nearest known occurrences of least bladdery milk vetch are on rocky flats or on rock banks above the Pend Oreille River in Washington (WHP 1998), and along Lake Pend Oreille, Idaho.

Aquatic, deciduous riparian and peatland guild sensitive species within the analysis areas do not occur in any areas affected by bark beetle attack; no harvest or project-related activities are proposed in or adjacent to any known sensitive plant occurrences within these guilds.

Forest Species of Concern

Black snakeroot (*Sanicula marilandica*): Black snakeroot is a herbaceous vascular plant found most often in low elevation wet forest habitats and/or adjacent to wet meadows, with incidental occurrences in upland moist forest habitat.

Salmonberry (*Rubus spectabilis*) and **fringecup** (*Tellima grandiflora*) are strictly riparian species. Both species are coastal disjuncts whose main range is west of the Cascades mountains. There is one documented occurrence of salmonberry within the analysis areas, and no documented occurrences of fringecup. No harvest activities are proposed in or near known occurrences or suitable habitat for these species. Small amounts of suitable habitat may be proposed for project-related watershed restoration (culvert removal, placement of instream structures).

Round-leaved rein orchid (*Platanthera orbiculata*): This widespread but infrequently occurring orchid is found most often in moist or wet forest habitat and occasionally in dry forest habitat. Like other members of the family Orchidaceae, it requires mycorrhizal relationships for the non-photosynthetic portion of its life cycle and for seed germination (Allen 1996). While no known occurrences of round-leaved rein orchid are within proposed treatment areas, several stands proposed for harvest and project-related activities could support this species.

Imbricate lichen occurs within the analysis areas, but is closely associated with late-seral to old growth wet forest guild habitats. However, in the St. Joe subbasin, imbricate lichen has been identified in disturbed riparian habitat (ICDC 1998). Habitats which might harbor this species experienced little to no recent bark beetle activity. No harvest or project-related activities are proposed in suitable habitat for this species.

Extent and Type of Suitable Habitat

Queries of the Timber Stand Data Base (TSMRS) were conducted for the distribution of potentially suitable sensitive plant habitat by guild. Site-specific information from timber stand examination records, National Wetland Inventory (NWI) maps, aerial photos, topographic position, existing habitat and survey information, personal knowledge and professional judgement were also considered in the identification of highly suitable habitat within each rare plant guild. Aquatic, peatland and deciduous riparian guild habitats were not included in the coarse habitat queries. These habitats are not delineated in TSMRS, and have not been affected by bark beetle attack; no activities are proposed within these guilds. Results of the coarse TSMRS queries are located in the project file. The following table summarizes those results. Acres of suitable habitat in Alternatives B through G are proposed for harvest or project-related activities, and are a subset of acres in Alternative A.

Table III-139. Acres of habitat for sensitive species and Forest species of concern, Priest Lake project area.

Sensitive Plant Guild	Total in analysis areas	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Wet Forest Guild	3,224	67	2	2	7	2	0.10	0
Moist Forest Guild	58,063	4,430	3,123	3,123	4,430	2,992	2,195	133
Dry Forest Guild	1,925	967	233	233	246	233	224	30
Aquatic Guild	911	0	0	0	0	0	0	0
Peatland Guild	1,546	0	0	0	0	0	0	0
Cold Forest Guild	315	0	0	0	0	0	0	0
Subalpine Guild	0	0	0	0	0	0	0	0
No Data	34,951	324	115*	115*	118*	114*	65*	5*
Total Acres	**100,935**	**5,788**	**3,453**	**3,453**	**4,786**	**3,322**	**2,465.10**	**168**

**Sufficient vegetation data for assignment to a rare plant guild is lacking for some bark beetle-affected stands which may be proposed for harvest. Under all action alternatives, field habitat assessment of stands lacking vegetation data must be conducted prior to project implementation; intensive surveys of identified highly suitable habitat would then be conducted. The relative occurrence of the guilds and the proportion of each which may be proposed for treatment is expected to remain about the same.*

Moist Forest Guild

The most commonly occurring habitats within beetle-affected areas and areas proposed for treatment within each alternative are assigned to the moist forest guild. In many cases, however, stands characterized as moist forest are actually mosaics of dry forest sites on ridges, with moist to mesic forest sites in swales or draws. The heaviest recent beetle activity and most proposed treatments are within the drier forest sites. Beetle activity and proposed treatments are generally less frequent in moist forest draws of the same stands. Some moist forest stands did experience heavy recent bark beetle activity; several of these stands are proposed for harvest and/or project-related activities in each alternative. An estimated 4,430 acres within this guild have been affected to some degree by the recent bark beetle activity.

Wet Forest Guild

Wet forest guild habitats experienced varying degrees of recent beetle activity; an estimated 67 acres within this guild have been affected.

Dry Forest Guild

Approximately 967 acres within the **dry forest** guild have been affected to some degree by recent beetle activity. However, no harvest or project-related activities are proposed in rock cliffs or banks in dry forest habitats which are likely to support least bladdery milkvetch, the only dry forest sensitive species known or suspected in the Priest Lake Ranger District.

Aquatic, Deciduous Riparian, Peatland, Subalpine and Cold Forest Guilds

Aquatic, deciduous riparian, peatland and cold forest guild habitats within the analysis areas generally experienced little or no recent beetle activity. No harvest or project-related activities are proposed in habitats within these guilds. Refer to Features Common to All Action Alternatives (Chapter II) for required buffers of Riparian Habitat Conservation Areas and peatland habitats. No subalpine forest guild habitats were identified within the analysis areas.

The remainder of beetle-affected areas have low potential to support sensitive plants of any habitat guild.

Current and Potential Threats to Documented Sensitive Plant Species, Forest Species of Concern and Highly Suitable Habitat

Peatland Guild

There are no known current threats to the documented occurrences of peatland guild species or their habitats. Future threats could include invasion of wetlands by orange and meadow hawkweed and/or common tansy. Future management activities which would significantly alter the hydrology of peatlands in the analysis areas could also imperil sensitive peatland species. Upland logging and road construction and grazing in wet meadows adjacent to peatland habitats could increase sediment and nutrient delivery, eventually changing floristic composition and leading to the extirpation of some sensitive species (Bursik and Moseley 1995).

The risk of fire in peatlands is difficult to gauge. Previous coring of peat in some north Idaho wet meadows reveals several charcoal layers and indicates that sporadic wildfires have occurred in these habitats (Niehoff 1997). These infrequent fires were probably surface burns that did not consume deep layers of peat (Niehoff 1997).

Given the history of wildfire within the analysis areas, peatland habitats there may have experienced fires following a succession of very dry years. These fires would likely have been of low to moderate intensity. If so, such fires would be considered to be within the historic range of variability for those habitats. It is not known if peatlands within the analysis areas have ever dried out sufficiently to experience a stand-replacing wildfire that would burn deep into the peat layer.

Aquatic and Deciduous Riparian Guilds

There are no known current threats to species or habitats of these guilds. The greatest potential threat to these guilds is the invasion of exotic species which could displace native vegetation and lead to extirpation of some sensitive species. Any activity or event which caused broad-scale soil and/or vegetation disturbance in or adjacent to these habitats would increase the risk of invasion by noxious weeds. Weed species of concern for these guilds include purple loosestrife (*Lythrum salicaria*), Eurasian water-milfoil (*Myriophyllum spicatum*) and common tansy (*Tanacetum vulgare*).

Subalpine and Cold Forest Guilds

There are no known current or potential threats to species or habitats of these guilds within the analysis areas.

Wet and Moist Forest Guilds

Long-term studies, recent population monitoring and informal observation indicate that sensitive species occurring in these guilds exhibit varying degrees of tolerance to disturbance of soil, vegetation and/or canopy cover. Threats to documented species occurrences in these guilds are as follows:

<u>Sensitive Plants</u>

Ground pine: There are no known current threats to the occurrences of ground pine within the analysis area. Future vegetation and/or ground disturbance or reduction in forest canopy from natural or human-caused events (such as wildfire, windthrow or timber harvest activity) could destroy ground pine occurrences and compromise habitat capability.

Studies have shown that low-intensity fire usually kills plants and destroys rhizomes in the litter layer, while rhizomes deeper in the soil persist to recolonize as early as the fifth growing month following fire (Williams 1990). By contrast, stand-replacing fire could destroy even deeply rooted rhizomes.

Previous harvest activity in the Priest Lake Ranger District within known occurrences of ground pine appeared to damage plants in landing areas and skid trails, while winter logging with snow cover minimized ground disturbance and impacts in most of the population (Penny 1996). It is unknown whether reduction of canopy cover stimulates the spread of ground pine, or if individuals have merely been able to survive around the edges of openings until canopy closure allows recolonization (Penny 1996).

Moonworts: Current threats to the occurrences of sensitive moonworts in the analysis areas include possible trampling and browsing by wildlife, competition and habitat loss due to noxious weed invasion, and recreation related disturbance.

Future threats to sensitive moonworts could include activities or events which would destroy the plants, underground rhizomes or soil mycorrhizae, or which would significantly reduce canopy cover in the plants' habitat. Such activities and events include ground based timber harvest and fuels treatment, canopy reduction to below about 75 percent, wildfire and prescribed underburning.

Deerfern: There are no current threats to known occurrences within the analysis areas. The occasional occurrence of deerfern on old road prisms and in immature forest indicates a certain tolerance of soil disturbance and canopy reduction. Formal monitoring of a deerfern population in the Watson analysis area indicates that production of fertile fronds and vegetative propagules may actually increase with moderate soil disturbance and moderate to extreme canopy cover reduction (Hammet 1997 and Penny 1995). However, activities or events which destroy large numbers of plants in an occurrence could jeopardize population viability.

Forest Species of Concern

Black snakeroot: This species appears to tolerate moderate levels of soil disturbance and canopy reduction. Flowering and fruiting appear to occur more frequently as canopy openings increase. Due to its relative abundance, its tolerance of disturbance and lack of threats to species viability, black snakeroot, which had previously been listed as sensitive, has been excluded from the Regional Forester's 1999 sensitive species list. However, it is still somewhat uncommon in north Idaho.

Round-leaved rein orchid: Dependence of this species on soil mycorrhizal relationships indicates a low tolerance for activities or events which would disrupt those relationships. stand-replacing wildfire or high intensity prescribed burning, as well as ground-based harvest or fuels treatment could cause sufficient soil disturbance to destroy mycorrhizal fungi on which this species depends.

Salmonberry: There are no current threats to occurrences of salmonberry or suitable habitat. Due to its relative abundance, its tolerance of disturbance and lack of threats to species viability, salmonberry, which had previously been listed as sensitive, was excluded from the Regional Forester's 1999 sensitive species list. However, it is still somewhat uncommon in north Idaho.

Fringecup: There are no current threats to occurrences of fringecup or suitable habitat. Due to its relative abundance, its tolerance of disturbance and lack of threats to species viability, the species, which had previously been listed as sensitive, was not included in the Regional Forester's 1999 sensitive species list. However, it is still somewhat uncommon in north Idaho.

Previous Sensitive Plant Surveys

Habitat assessment and sensitive plant surveys have been conducted for unrelated projects in portions of the analysis areas. Many of those project analyses were included in the recently completed Winter Damage Salvage Project Environmental Assessment (USDA 1998). Results of previous surveys pertaining to that project are located in the Storm Salvage project file (pp. VIII-12 through pp. VIII-19).

Other activities within the analysis areas for which previous sensitive plant habitat assessment and/or surveys were conducted (and the year sensitive plant surveys were completed) include the following: Lakeface Lamb (1996); Quartz Mountain (1991); Butch Creek (1994); Flat Creek Salvage and West Moores-Moores Creek Salvage (1993); Peewee/Steep Creek Trail Project (1994); Bear Paw-Pure H Salvage (1994); Green Goose Salvage (1998); Fedar White Pine (1998); Chips Ahoy (1998); Rogers Mosquito (1996); and the Binarch Ridge, Castro Correction and Road 1347 Tip Over Categorical Exclusions (1996). Results of sensitive plant surveys for the above projects are located in their respective project files. Many of those surveys included several stands affected by the recent bark beetle attack.

No sensitive plant surveys have been conducted specifically for this analysis, although some habitat assessment was accomplished by IPNF North Zone botany personnel during old growth field sampling for development of the proposed action. Regional direction (Leonard 1992) provides that the need for and extent of field reconnaissance should be commensurate with the risk associated with the project and species involved, and the level of knowledge already in hand. Refer to Features Common to All Action Alternatives (Chapter II) for survey requirements prior to project implementation.

Changes in TES Plant Habitat from Historic Conditions

Information on historic conditions and changes to TES plant habitat in the Priest Lake subbasin is derived from that compiled for the Draft IPNF North Zone Geographic Assessment (Mousseaux 1999).

There is little specific information pertaining to the historical occurrence and distribution of sensitive plants on federal and non-federal lands in the project area. In addition, assumptions must be made about the historic occurrence of suitable sensitive plant habitat. It is evident that the current condition of vegetation in the analysis areas has changed, in many respects, from the historic condition. Some of the most significant changes to vegetation that have impacted sensitive plants include loss of riparian habitat, fragmentation of mature moist to wet forest habitat by timber harvest, conversion of peatland habitat to agricultural and other uses, and introduction of numerous non-native plant species, many of which are considered to be noxious or undesirable. Non-native species can reduce native biodiversity by displacing native plant species, including sensitive plants.

Some peatland habitats in the project area have been drained, plowed, flooded and/or permanently converted to other uses. Riparian areas in the Priest River subbasin have also been impacted. Streams and rivers served as natural travel corridors for early settlers, and their valleys were heavily harvested and roaded beginning in the early 1900s. Much of this habitat has been permanently altered and/or fragmented by timber harvest, mining, roading, agriculture and urban development. Non-native plants are increasing in disturbed riparian areas, especially along roads. It is estimated that 83 percent of historical peatland habitat, including deciduous riparian habitat, remains intact in the Priest subbasin.

Studies of the Priest River subbasin show that large areas of mature and old growth forests have been fragmented by timber harvest. Old growth has declined from historic levels, and much of what remains now tends to occur in long, narrow stringers influenced by surrounding younger stands. Much sensitive plant suitable habitat consists of late seral or old growth forest in wet to moist habitat types. It is estimated that 74 percent of historical moist, mature forest habitat in the Priest subbasin remains intact today. Approximately 57 percent of historical wet forest habitat in the Priest subbasin remains intact today.

Subalpine and cold forest guild habitats have been impacted less overall than other guilds, with approximately 81 percent remaining in the Priest subbasin. However, some significant impacts from timber harvest and road construction have occurred to riparian habitats within the cold forest guild.

Low elevation dry ponderosa pine and Douglas-fir/bunchgrass communities historically occupied a relatively small portion of the total land area in the subbasin; however, they have been some of the most altered. Fire suppression has changed the composition and structure of these habitats. Only about 23 percent of historical dry forest guild habitats remains intact in the Priest subbasin.

While precise data are not available on the amount of sensitive plant habitat and populations that have been impacted or lost due to past disturbances on federal and non-federal lands, it can be surmised that significant changes have occurred for some species, including loss of habitat and/or loss of populations. Recolonization opportunities for rare plants from existing populations have diminished. One of the most important implications of habitat loss and fragmentation is the reduced ability of sensitive plants to respond to random natural or human-caused events or disturbances in the environment.

ENVIRONMENTAL CONSEQUENCES

Methodology

Analysis was conducted using results of previous sensitive plant surveys, current distribution and condition of sensitive plant species in habitats similar to those found in the proposed treatment sites, current knowledge of the ecology of sensitive species known or suspected within the analysis areas, and professional judgement. The extent of habitat alteration from the recent Douglas-fir beetle infestation, and the types of proposed harvest and project-related activities were considered in evaluating the effects to documented occurrences and/or suitable habitat for each alternative.

The cumulative effects areas for sensitive plants and highly suitable habitat was determined to be the Priest River subbasin.

Effects to sensitive species and suitable habitat from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

> ***very low*** *= no measurable effect on individuals, populations or habitat*
> ***low*** *= individuals, populations and/or habitat not likely affected*
> ***moderate*** *= individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support sensitive plant species*
> ***high*** *= populations would likely be affected and/or habitat capability may over the long term be reduced below a level which could support sensitive plant species*

Effects to populations from disturbance events (natural or human-caused) are difficult to quantify with certainty for all sensitive plant species and Forest species of concern. Specific knowledge of population biology and autecology is lacking for several species addressed in this analysis, particularly the sensitive moonworts (*Botrychium* species) and round-leaved rein orchid. Much of the current knowledge regarding sensitive plant species is based on informal observation (non-empirical) and even anecdotal information.

Long-term studies of peatland species and their habitats (Rumely 1956, Bursik and Moseley 1992, and Bursik and Moseley 1995) and recent monitoring of deerfern (Blake and Ebrahimi 1992) and groundpine (Penny 1996) provide a greater understanding of the relationship of habitat disturbance to the integrity of populations of these species.

Presence of sensitive plant species is presumed in unsurveyed, highly suitable sensitive plant habitat. Protection of populations and contiguous adjacent unoccupied highly suitable habitat are assumed to be an effective conservation strategy. As stated in sensitive plant Features in Chapter II, populations and habitat would be protected; some isolated individuals or occurrences may be impacted by activities. Occurrences that are likely to be discovered during field surveys prior to project implementation would have mitigation measures designed by the Zone or Forest Botanist to ensure populations are maintained.

While a high number of acres have been identified as containing highly suitable habitat, based on past sensitive plant surveys, only a very small percentage of suitable habitat is likely actually occupied. Even with the presence of

abundant suitable habitat, because the plant species addressed in this analysis are rare, most suitable habitat is unoccupied.

Indicators used to measure effects on sensitive plants and suitable habitat include the predicted reduction in canopy cover from the recent Douglas-fir beetle infestation and different harvest treatments, the amount of each proposed activity, the extent of ground disturbance, the proximity of known sensitive plant occurrences and suitable habitat to proposed activities and the predicted reduction of heavy fuel loads.

The following table provides an assessment, based on the best available information, of the risk to sensitive plants in the analysis areas from certain types of disturbance.

Table III-140. Summary of risk to sensitive plants and Forest species of concern from proposed activities in highly suitable habitat, by plant guild.

Proposed Activity or Event	Sensitive Plant Guild Potentially Affected	Risk of Adverse Impacts to Sensitive Plant Occurrences (without mitigation)
Loss of < 50% canopy cover due to insects or disease	Moist Forest / Wet Forest Dry Forest	Moderate Low - Moderate
Loss of > 50% canopy cover due to insects or disease	Moist Forest / Wet Forest Dry Forest	High Moderate
Regeneration harvest including site preparation	Moist Forest / Dry Forest	High
Commercial thinning and salvage using ground based equipment	Moist Forest / Wet Forest Dry Forest	High Moderate - High
Helicopter and roadside salvage	Moist Forest / Dry Forest / Cold Forest	Low
Full road obliteration	Wet Forest / Moist Forest / Dry Forest	High
New road construction	Wet Forest / Moist Forest / Dry Forest / Peatland	High
Road reconstruction/reconditioning	Wet Forest / Moist Forest / Dry Forest	Low
Channel crossing removal (culverts)	Wet Forest / Moist Forest	Low - Moderate
Road closure, ripping, seeding	All	Low
In-stream fisheries / watershed restoration (structure placement w/ equipment)	Deciduous Riparian / Wet Forest / Peatland	High
Fuel reduction by underburning	Moist Forest / Wet Forest Dry Forest	Moderate - High Low - Moderate*
Fuel reduction - mechanical	Moist Forest / Dry Forest	Moderate - High
Noxious weed prevention and treatment	Dry Forest / Moist Forest	Low - Moderate
Stand-replacing wildfire	Moist Forest / Dry Forest	Moderate - High

** Some Dry Forest sensitive plant species may be dependent on periodic low levels of disturbance from fire, such as that which occurred historically in some dry forest habitats. The timing of an underburn relative to soil moisture in suitable habitat and the flowering and fruiting of the plant species of concern also influences potential effects.*

Without mitigation, there exists a high likelihood of adverse effects to sensitive plants in highly suitable habitat, especially from moderate- to high-risk activities. These effects could lead to loss of population viability, or trend toward federal listing, especially for sensitive plant species in the moist and wet forest guilds.

For certain species, moderate- to low-risk activities such as salvage, low intensity fire and road reconstruction, are not likely to adversely affect population viability, even though individual plants may be affected. Observations and monitoring information indicate that some activities may have little effect or even a positive effect on species tolerant of low to moderate levels of disturbance, such as groundpine (Williams 1990 and Penny 1996) and deerfern (Blake and Ebrahimi 1992).

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

For sensitive plants direct, indirect and cumulative effects were not addressed at the analysis area level. All effects were addressed at the project area level.

Direct, Indirect and Cumulative Effects at the Priest Lake Project Area Scale

Effects Common To All Alternatives

Direct and Indirect Effects

Salmonberry, fringecup and **black snakeroot** have been excluded from the Regional Forester's 1999 sensitive species list because they are more abundant than previously thought and are tolerant of moderate levels of disturbance. Their status is now considered to be secure at the rangewide, regional and state levels; however, these three Forest species of concern are still relatively uncommon at the Forest planning level. Individuals of these species may have been impacted by recent beetle activity, and/or may be impacted during timber harvest or project-related activities under the action alternatives; any such impacts would not jeopardize population or species viability or lead to a trend to federal listing.

Individuals of moist forest sensitive species may be impacted, either from beetle activity or from timber harvest activities. Such impacts would not lead to a trend to federal listing or a loss of population or species viability for any moist forest sensitive species.

Cumulative Effects

Implementation of any of the alternatives would not contribute to cumulative effects for **salmonberry, fringecup** or black **snakeroot.**

Predicted cumulative impacts resulting from recent Douglas-fir beetle activity in moist forest habitat could include high-intensity, duff-replacing wildfire from predicted high fuel loading in untreated areas. Such a fire, if it were to occur, would be detrimental to obligate mycorrhizal species such as the moonworts and round-leaved rein orchid. Populations of groundpine could be destroyed if such a fire were intense enough to burn deeply-rooted rhizomes. The prospect of recolonization of affected habitat by any of these three species would depend on the extent and duration of habitat alteration and the availability of an adjacent seed source. Cumulative impacts to these three species related to stand-replacing wildfire would be predicted to be low to moderate.

Effects Common to All Action Alternatives

No currently documented populations of any sensitive plant species would be directly or indirectly impacted by implementation of any action alternative. Populations documented during sensitive plant surveys prior to project implementation would be protected.

Aquatic and Deciduous Riparian Guilds

No harvest or project-related activities are proposed within aquatic or deciduous riparian habitats in the analysis areas. Based on the location of proposed activities and professional judgement, no deciduous riparian or aquatic

habitat able to support any sensitive plant species would be impacted by implementation of any of the action alternatives; there would be no direct or indirect impacts to any sensitive species occurring in these guilds.

Peatland Guild

Peatland habitats are present in the analysis areas. Buffering these habitats as proposed (Features Common to All Action Alternatives, Chapter II) would eliminate the risk of sediment or nutrient delivery or hydrological change to these habitats from proposed activities (Soils and Aquatic Resources, Chapter III). There would be no direct or indirect impact to any sensitive species or suitable habitat within this guild from implementation of any action alternative.

Subalpine and Cold Forest Guilds

There are no subalpine habitats in the analysis areas. There would be no direct or indirect impact to members of this guild. Cold forest habitat, while present in the analysis areas, is not proposed for harvest or project-related activities in any of the action alternatives. There would be no direct or indirect impact to any sensitive plant species occurring in habitats of this guild.

Wet and Moist Forest Guilds

Timber harvest in riparian wet forest habitats would not occur under any action alternative (Features Common to all Action Alternatives, Chapter II). There would be no direct or indirect impact from timber harvest as proposed on any sensitive species occurring in riparian habitats of this guild. Refer to the analysis of project-related activities for potential impacts to this guild from those activities.

Direct and indirect impacts to suitable wet forest habitat would be minimal, since only a small amount of this guild is proposed for harvest activity under any action alternative. Individuals of this guild may be impacted, but such impacts would not lead to a trend to federal listing or a loss of population or species viability.

Under all action alternatives, incidental direct impacts to undetected individuals of sensitive **moonworts** (*Botrychium* species) may occur where activities are proposed in wet forest or moist forest habitats. Because of their small stature and unpredictable appearance of above ground stalks, individual moonworts could go undetected even during a thorough survey. Virtually all highly suitable habitat for sensitive moonworts in the wet forest guild would be buffered from harvest or project-related activities. However, sensitive moonworts have a broader habitat range than most other sensitive plant species, and isolated occurrences in moist forest habitat and such unlikely sites as road turnouts could be impacted.

There could be a risk of prescribed fire escaping to impact individual sensitive plants and suitable riparian, wet forest and moist forest habitat which was buffered from harvest activity. The extent of risk would depend on many factors, including timing of the burn, phenology of the plant species involved and occurrence of abnormally wet or droughty conditions in suitable habitat at the time of the burn. Based on the best available knowledge and the location of proposed underburn units to known sensitive plants and highly suitable habitat, the risk of direct or indirect impacts to any sensitive species from escaped fire under any action alternative would be low.

Dry Forest Guild

Dry forest habitat within the nine analysis areas is considered of mostly low potential to support any sensitive plant species. Any rock cliff microsites which could support least bladdery milkvetch were likely not affected by recent beetle activity, and would be buffered from harvest and project-related activities. There would be no impact to this dry forest sensitive plant species.

Project-Related Activities

Selective Harvest Only (Exclusive of Fuels Treatment)

For moist forest and non-riparian wet forest guilds in which removal of beetle-killed trees only would occur, there may be incidental impacts to individuals of some sensitive plant occurrences. The species most likely to incur incidental impacts to individuals include sensitive **moonworts** (*Botrychium* species) and **round-leaved rein orchid** (*Platanthera orbiculata*). This type of harvest would not reduce canopy cover significantly below what has already occurred from bark beetle mortality.

Regeneration Harvest

Regeneration harvest is proposed only where ≥50 percent of the basal area of the stand is predicted to be lost due to bark beetle mortality. For moist forest and non-riparian wet forest guilds in which regeneration harvest using ground-based systems would occur, adverse impacts related to canopy removal would in many cases not be significantly different from that under the No Action alternative. These areas generally have a high percentage of Douglas-fir overstory and very heavy bark beetle mortality (80-90 percent of the canopy cover in some cases), and removal of green trees may contribute to 20 percent or less of additional canopy reduction. In other cases, up to 30 percent additional canopy removal would occur, and potential adverse impacts from canopy reduction would differ from those of the No Action alternative. The likeliest adverse effects expected would be to species and populations intolerant of open canopy conditions and those dependent on soil mycorrhizal relationships (**moonworts** and **round-leaved rein orchid**). The extent of adverse impacts on these sensitive species or populations would depend on the combination of proposed harvest system (ground-based being the most detrimental) and fuels treatment (grapple piling or burning being the most detrimental compared to yarding of tops).

Yarding Method for Timber Harvest

Helicopter yarding would have insignificant impacts on sensitive plant species and suitable habitat, as ground disturbance would be minimal. In areas proposed for skyline harvest, ground disturbance would be largely confined to long, narrow corridors; canopy cover would be virtually 0 percent in these corridors. With skyline systems, there is usually some flexibility in the designation of corridors, so that microsites of highly suitable habitat can often be buffered from their effects. Tractor yarding generally produces the most detrimental and long-term impacts to sensitive plants and habitats, mainly from soil compaction and ground disturbance. Impacts are usually confined to designated skid trails, and there is some flexibility in skid trail location so that microsites of highly suitable habitat can often be avoided.

New Road Construction, Road Reconstruction, and Reconditioning

These activities vary in their potential for effects to moist, wet, dry forest and peatland guild habitats and species. New road construction is a high ground disturbance activity, constituting a high risk to sensitive species in these guilds. Prior to new road construction, previously unsurveyed, highly suitable habitat in the activity area would be surveyed and any new populations would be protected. Road reconstruction and reconditioning are low risk activities in terms of direct or indirect effects to sensitive plants and habitat. For these activities, existing road prisms would be treated which are already disturbed and of very low habitat suitability. While there are a few sensitive plant occurrences on the IPNF on old roads or cutbanks, they are usually individuals isolated from the main occurrence.

Winter Logging

For areas which would be harvested only in winter, effects to sensitive plants would be largely confined to those associated with canopy removal, as ground disturbance would be minimal.

Fuels Treatment

Various methods of fuels reduction are proposed under the action alternatives, all having the potential impact sensitive plants. Slashing, yarding tops and lop and scatter fuels treatments have a negligible effect on sensitive plant species and habitat, since these methods cause the least ground or vegetation disturbance. Grapple piling and underburning have the greatest potential for adverse impacts to sensitive plants, since they cause the most ground and/or vegetation disturbance. Spring burning in particular can impact sensitive plant individuals, particularly moonwort species. Features for TES Plants (Chapter II) would protect documented populations and highly suitable habitat and those that may be discovered during field surveys prior to project implementation. There would be a risk of increasing certain noxious weed species with burning, depending on the proximity to existing infestations and the cover type of the area treated (refer to Chapter III, Noxious Weeds).

Fireline and various types of fuelbreak construction have the potential to impact sensitive plants and habitat through vegetation and ground disturbance. Project design (Features Common to All Action Alternatives, Chapter II) would provide protection for documented populations and populations discovered prior to implementation.

Watershed restoration projects

Sensitive plant species of **wet forest** guild habitats could be impacted during placement of in-stream structures and culvert removal at stream crossings. Site-specific surveys would be conducted prior to implementation of any such projects. Newly identified sensitive plant populations would be protected. Isolated or undetected individuals of some species may be impacted. No project-related activities are proposed in non-riparian habitats of this guild.

Riparian restoration projects generally help to stabilize stream channels, thus protecting streamside vegetation from chronic disturbance. These projects, while they may impact individuals, usually result in long-term benefits to sensitive plants and suitable habitat.

Tree planting

This activity would occur where regeneration harvest has left the residual stand understocked. Additional soil disturbance from preparation of planting spots would not impact most sensitive plant species; incidental impact to sensitive moonworts could occur, with a low level of cumulative impacts expected to occur.

Weed treatment and prevention

Weed treatment and prevention would occur following the guidelines of the Priest Lake Control Project (USDA 1997). Effects to sensitive plants from such activities are addressed in that document.

Cumulative Effects

No cumulative impacts to sensitive species or suitable habitat in **aquatic, deciduous riparian, peatland, dry forest, subalpine** or **cold forest** guilds are expected from implementation of any of the action alternatives.

There would be no cumulative impacts on most documented **moist forest** and **wet forest** sensitive plant occurrences within the analysis areas. Cumulative impacts to members of the genus *Botrychium* would be expected to be low. Cumulative impacts to **wet forest** habitat in general would be expected to be low.

Foreseeable Actions

A list reasonably foreseeable and ongoing projects in Priest Lake Ranger District is included in Appendix E. Projects include timber harvest on federal, State and private lands, repairs and resurfacing on county and Forest Service roads, wildlife burns, recreation and road access, grazing allotments and slash disposal.

Implementation of projects on National Forest lands would contribute insignificant impacts to sensitive plants or suitable habitat, since federal lands are managed to maintain sensitive plant populations. Sensitive plant and habitat assessment are conducted for all ground and/or vegetation disturbing activities in the District. While individuals of some sensitive plants may occasionally be impacted, cumulative impacts to species and habitats would be expected to be low.

Implementation of the Douglas-fir Beetle project on the adjacent Newport Ranger District would contribute insignificant impacts to sensitive plants and suitable habitat, since that project would be implemented under the same guidelines (see Features Common to All Action Alternatives, Chapter II).

State and private landowners are not required to maintain sensitive plant populations; impacts to some sensitive species and habitat have likely occurred and may continue, contributing at least low levels of cumulative impacts.

Alternative A (No Action)

Direct and Indirect Effects

Predicted impacts from the recent beetle infestation include changes in forest canopy cover and wildfires of high intensity from heavy fuel loads. There has been beetle activity in the vicinity of at least one known sensitive plant occurrence, although the extent of impacts is not known. Direct impacts to the known occurrence of **deerfern** in the Binarch analysis area could occur from an increase in light over the population as beetle-killed trees lose their canopy. However, recent studies of deerfern populations in a clearcut indicate some degree of tolerance for increased light (see Affected Environment above). Indirect impacts may include destruction of the plants as beetle-killed trees fall over.

As previously mentioned, formal study of **groundpine** populations in the district indicate that the species is tolerant of early seral conditions provided there is some canopy cover, while individual plants seem to suffer from total canopy removal (Penny 1996). The species' documented ability to survive low-intensity fires but vulnerability to stand-replacing fire (Williams 1990) indicates that a stand-replacing wildfire in suitable habitat for this species could destroy entire occurrences. It would be impossible to predict that such a fire would actually occur; however, due to the high level of untreated fuels under this alternative, a future wildfire in suitable beetle-affected habitat for groundpine would be of a higher intensity.

All other moist forest and wet forest guild species occur in mid- and late successional habitats, and appear to prefer more closed canopy conditions. Those species likely to occur in beetle-affected areas that do not tolerate canopy openings include most sensitive **moonworts** (*Botrychium* species) and the Forest species of concern **round-leaved rein orchid**. Direct impacts could include loss of canopy cover over populations of these species. Indirect impacts to these species could include destruction of individual plants as beetle-killed trees fall over and disruption of soil mycorrhizae from loss of shade.

Peatland guild species occur in habitats that infrequently experienced fire. Peat coring in north Idaho peatlands (Rumely 1956 and Neihoff 1998) has revealed several charcoal layers in peat strata which accumulated since the last glacial period. It is not known whether peatland habitats in the analysis areas have ever dried sufficiently to support even a low-intensity wildfire. No direct or indirect impacts to peatland habitats would be expected from implementation of the No Action alternative.

As a direct result of the recent beetle infestation, 4,430 acres of moist forest habitat have been or will likely be impacted; most of these impacts are attributable to loss of canopy cover and resulting reduction in soil moisture (and, in some cases, promotion of early seral vegetation which could outcompete some moist forest sensitive plant species). Some level of impacts to wet forest habitat (also related to canopy cover, soil moisture and early seral vegetation) are predicted on 67 acres.

Cumulative Effects of Alternative A

Cumulative impacts to wet forest habitat would be predicted to be low overall, given the small amount of such habitat that has been affected by recent bark beetle activity.

Cumulative impacts to highly suitable moist forest habitat related to loss of canopy cover would be predicted to be moderate where stands have been sufficiently opened to promote establishment of early seral understory vegetation. The likeliest cumulative impacts would be to those species with a broader habitat range (**moonworts, round-leaved rein orchid** and **groundpine**) which seem to require dense shade and/or soil mycorrhizae and which may not compete successfully with early seral forbs. Cumulative impacts to moist forest habitat where canopy cover has not been reduced below about 75 percent would be low.

Predicted cumulative impacts resulting from recent Douglas-fir beetle activity in moist forest habitat could include high-intensity, duff-replacing wildfire from predicted high fuel loading in untreated areas. Such a fire, if it were to occur, would be detrimental to obligate mycorrhizal species such as the moonworts and round-leaved rein orchid. Populations of groundpine could be destroyed if such a fire were intense enough to burn deeply-rooted rhizomes. The prospect of recolonization of affected habitat by any of these three species would depend on the extent and duration of habitat alteration and the availability of an adjacent seed source. Cumulative impacts to these three species related to stand-replacing wildfire would be predicted to be low to moderate.

Long-term impacts to **deerfern** could occur in the event of a stand-replacing wildfire as a result of heavy fuel loads. Deerfern is apparently able to survive light surface fires, and may recolonize by sprouting from rhizomes or by spores from adjacent populations (Barbour and Billings 1988). Its response to severe wildfire is not known. Fire intervals in its cool, wet forest preferred habitat are estimated to be several hundred years, so that large-scale fires are usually catastrophic (Barbour and Billings 1988). Cumulative impacts on deerfern from a potential future wildfire would be difficult to predict.

Cumulative impacts to peatland habitats are also related to future catastrophic wildfires resulting from heavy fuel loads. Such a fire, should it occur upslope from peatland habitats, could introduce elevated nutrient and sediment levels to these ecosystems. Peatland hydrology could also be altered. Such changes in peatland habitats could lead to a change in plant species composition and the extirpation of some sensitive plant species (Bursik and Moseley 1995). The risk of a future stand-replacing wildfire that could impact peatland habitats would be difficult to quantify. Cumulative impacts would be predicted to be low to moderate, depending on the occurrence and proximity of a stand-replacing wildfire to peatland habitat.

Alternative B (Proposed Action)

Direct and Indirect Effects

In addition to Effects Common to All Alternatives and Effects Common to All Action Alternatives above, individuals of **round-leaved rein orchid** could be impacted by ground-based timber harvest and mechanical fuel treatment or underburning. An underburn of low intensity may allow survival of soil mycorrhizae, so that recolonization of suitable habitat would be possible. Round-leaved rein orchid populations tend to occur as widely-scattered individuals rather than in dense clusters, so that impacts to large numbers of individuals from activity in a given area are unlikely. Round-leaved rein orchid has been found in a broad range of habitats in mid- to late-seral stands (ICDC 1998), indicating a certain adaptability to different conditions of soil moisture and stand age. The adaptability of the soil mycorrhizae on which the species depends to environmental changes is key to its ability to survive alterations of habitat, but at this time is difficult to predict with certainty. The study of soil mycorrhizae and their symbiotic relationships with the roots of plants is still in its infancy (Allen 1996).

While there would be no direct or indirect impact to known **groundpine** occurrences, suitable habitat for this species could be impacted by regeneration harvest in moist or wet forest habitat. Impacts of regeneration harvest would be largely attributed to ground disturbance and fuels treatment, since in most cases only ten percent or less

additional green tree removal would occur. However, a few stands would experience substantial further canopy reduction from removal of additional green trees. In these stands, habitat capability for groundpine may be reduced below its current level.

Based on the risk ratings for each suitable habitat guild from different activity types, the following table displays the amount of suitable habitat that may be impacted by high risk activities under this alternative.

Table III-141. Acres/(miles) of suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative B.

Activity Type	Wet Forest	Moist Forest	Dry Forest	No Data
Regeneration Harvest (ground based)	1	1,360	15	58
Selective Harvest (ground based)	0.56	959	51	24
Grapple Piling	0	383	4	1
Underburning	1	1,883	229	73
Road Construction	(0.06)	(8.33)	(0.33)	(0.32)
Road Obliteration	(2.84)	(38.05)	(0.04)	(1.49)

Cumulative Effects

Cumulative impacts from canopy removal in moist forest habitat in addition to that from beetle kill would remain low to moderate, since in most cases associated green tree removal would result in further reduction of canopy cover by less than ten percent.

Given the requirements for surveys and provision for protection of sensitive and Forest species of concern plant populations, cumulative impacts to groundpine and round-leaved rein orchid from ground-based harvest activities would be considered to be low. Reducing fire hazards in harvested areas through fuels treatment (see Fire/Fuels Chapter III) also reduces the predicted cumulative impacts.

<u>Alternative C</u>

Direct and Indirect Effects

Direct and indirect impacts under this alternative would be similar to those under Alternative B, with the exception that there would be no impacts to any suitable sensitive plant habitat from new road construction. In addition, since no new roads would be constructed, there would be less ground-based timber harvest and more helicopter harvest. Thus, impacts from ground disturbance would be less than with Alternative B.

Based on the risk ratings for each suitable habitat guild from different activity types, the following table displays the amount of suitable habitat that may be impacted by high risk activities under this alternative.

Table III-142. Acres/(miles) of suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative C.

Activity type	Wet Forest	Moist Forest	Dry Forest	No Data
Regeneration Harvest (ground based)	1	832	8	42
Selective Harvest (ground based)	0.56	703	4	19
Grapple Piling	0	341	0	3
Underburning	1	1,860	229	69
Road Construction	(0)	(0)	(0)	(0)
Road Obliteration	(2.84)	(40.41)	(0.04)	(1.49)

Cumulative Effects

Cumulative impacts would be similar to those under Alternative B.

<u>Alternative D</u>

Direct and Indirect Effects

Direct and indirect impacts from ground-based harvest activities under this alternative would be similar to those under Alternative B, with the exception that additional predicted beetle-killed timber stands would be harvested. As mentioned previously, many stands characterized by TSMRS queries as moist forest habitat are actually a mosaic of moist and dry forest, with dry forest sites experiencing heavier Douglas-fir beetle attack.

Based on the risk ratings for each suitable habitat guild from different activity types, the following table displays the amount of suitable habitat that may be impacted by high risk activities under this alternative.

Table III-143. Acres/(miles) of suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative D.

Activity type	Wet Forest	Moist Forest	Dry Forest	No Data
Regeneration Harvest (ground based)	1	1,674	24	58
Selective Harvest (ground based)	6	1,229	51	24
Grapple Piling	0	353	0	0.02
Underburning	1	2,288	237	76
Road Construction	(0.06)	(9.31)	(0.48)	(0.32)
Road Obliteration	(2.84)	(44.68)	(0.04)	(2.08)

Cumulative Effects

Cumulative impacts related to loss of canopy cover from implementation of this alternative would be similar to those under Alternative B. Cumulative impacts related to soil disturbance from ground-based timber harvest and fuels treatments and underburning would remain low with requirements for survey and protection of sensitive plant populations.

Alternative E

Direct and Indirect Effects

Implementation of this alternative would have reduced direct and indirect impacts to suitable habitat associated with soil disturbance in some stands proposed for harvest. However, impacts of ground-based selective harvest in many stands with at least 50 percent Douglas-fir mortality would not be substantially different in many cases from regeneration harvest as proposed in Alternatives B, C, D and F.

Based on the risk ratings for each suitable habitat guild from different activity types, the following table displays the amount of suitable habitat that may be impacted by high risk activities under this alternative.

Table III-144. Acres/(miles) of suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative E.

Activity type	Wet Forest	Moist Forest	Dry Forest	No Data
Regeneration Harvest (ground based)	0.24	1,021	15	45
Selective Harvest (ground based)	2	1.364	51	36
Grapple Piling	0	416	0	9
Underburning	0.24	1,384	75	62
Road Construction	(0.06)	(8.03)	(0.17)	(0.25)
Road Obliteration	(1.16)	(39.49)	(0.04)	(1.49)

Cumulative Effects

Cumulative impacts of this alternative would be similar to those under Alternative B.

Alternative F

Direct and Indirect Effects

Implementation of this alternative would have reduced direct and indirect impacts to suitable habitat associated with soil disturbance, since fewer acres would be treated than under Alternatives B, C, D and E. However, impacts of ground-based selective harvest in many stands with at least 50 percent Douglas-fir mortality would not be substantially different in many cases from regeneration harvest as proposed in Alternatives B, C, D and E.

Based on the risk ratings for each suitable habitat guild from different activity types, the following table displays the amount of suitable habitat that may be impacted by high risk activities under this alternative.

Table III-145. Acres/(miles) of suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative F.

Activity type	Wet Forest	Moist Forest	Dry Forest	No Data
Regeneration Harvest (ground based)	0	690	4	13
Selective Harvest (ground based)	0	849	51	21
Grapple Piling	0	246	0	0.02
Underburning	0.24	1,047	218	26
Road Construction	(0.06)	(4.09)	(0.17)	(0)
Road Obliteration	(1.35)	(28.82)	(0.04)	(1.57)

Cumulative Effects

Cumulative impacts of this alternative would be similar to those under Alternative B. Cumulative impacts related to soil disturbance from ground-based timber harvest and fuels treatments and underburning would remain low with requirements for survey and protection of sensitive plant populations.

<u>Alternative G</u>

Direct and Indirect Effects

In addition to impacts as described under Effects Common to All Alternatives, implementation of this alternative would have negligible direct and indirect impacts to suitable sensitive plant habitat. Additional impacts caused by fuels treatments would be insignificant, since only 168 acres of suitable habitat would be treated.

Based on the risk ratings for each suitable habitat guild from different activity types, the following table displays the amount of suitable habitat that may be impacted by high risk activities under this alternative.

Table III-146. Acres/(miles) of suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative G.

Activity type	Wet Forest	Moist Forest	Dry Forest	No Data
Regeneration Harvest (ground based)	0	0	0	0
Selective Harvest (ground based)	0	0	0	0
Grapple Piling	0	0	0	0
Underburning	0	133	30	5
Road Construction	0	0	0	0
Road Obliteration	(2.33)	(24.69)	(0.04)	(0.90)

Cumulative Effects

Cumulative impacts of this alternative on sensitive plants and suitable habitat are expected to be about the same as those predicted under Alternative A. Reduction of fuel loads in beetle-affected areas would be negligible, and impacts to sensitive plants and suitable habitat related to ground and vegetation disturbance would be minimal.

While sensitive plant occurrences identified on federal lands are managed to maintain population and species viability, adjacent State and private landowners are not required to protect these species. Therefore, loss of populations and modification of habitat for some sensitive species on those lands has likely occurred and may continue. A low to moderate level of cumulative effects from activities on lands under other ownership is likely for at least some sensitive plant species. Past activities on federal lands, prior to policies affording protection of rare plants, have likely affected populations and habitat of some sensitive plant species.

Effects of Opportunities

It should be noted that accomplishment of additional watershed/wildlife restoration projects, weed treatment and prevention other than those under contract clauses and timber stand improvement work would be subject to availability of KV or other appropriated funding. The direct and indirect effects would be the same for these potential activities as discussed above.

Timber stand improvement work

Timber stand improvement projects would occur in stands with overall low potential to support sensitive plant species. Individual sensitive moonworts could be impacted, with a low level of cumulative impacts expected.

Determination of Effects

Based on the above analysis, and with the provisions for surveys and protection of sensitive plant populations (Features Common to All Action Alternatives, Chapter II), the following table represents the determination of effects to sensitive plants for each alternative. The Biological Evaluation from which the table was derived is in the project file. A description of habitat guilds and list of sensitive species is included in Appendix B.

Table III-147. Summary of determination of effects on sensitive plant species, by guild, for each alternative.

Species Guild	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
1. Aquatic Species	NI	NI	NI	NI	NI	NI	NI
2. Deciduous Riparian Species	NI	NI	NI	NI	NI	NI	NI
3. Peatland Species	NI	NI	NI	NI	NI	NI	NI
4. Wet Forest Species	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH
5. Moist Forest Species	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH
6. Subalpine Species	NI	NI	NI	NI	NI	NI	NI
7. Cold Forest Species	NI	NI	NI	NI	NI	NI	NI
8. Dry Forest Species	NI	NI	NI	NI	NI	NI	NI

NI = No Impact
MIIH = May Impact Individuals or Habitat with no trend to federal listing or loss of species or population viability
WIIH = Will Impact Individuals or Habitat with a likely trend to federal listing and/or loss of population or species viability
BI = Beneficial Impact

Sensitive Plant Surveys

The following measures are required to validate the Determination of Effects in this EIS:

As described in Chapter II, all previously unsurveyed areas identified as potential or highly suitable habitat that, as a result of the proposed activity, would have a high risk of adverse effects to sensitive plants or habitat and a likely reduction in population viability, must be surveyed prior to project implementation. Some areas previously surveyed may be resurveyed, based on the date and intensity of the most recent sensitive plant survey and the risk to sensitive habitat from proposed activities.

In addition, up to 118 acres in the Priest Lake analysis areas proposed for treatment (Alternative D) must be field assessed for habitat suitability, and identified suitable habitat surveyed, prior to project implementation. The table below displays the number of acres within and/or adjacent to proposed harvest units which must be surveyed prior to project implementation. Survey acres were based on coarse habitat queries , aerial photograph and topographical map interpretation, previous sensitive plant surveys, risk of adverse impacts to sensitive plants and

suitable habitat from the proposed activity, and professional judgement. Specific units which must be surveyed are identified in Appendix D. It should be noted that potential habitat occurs only in portions of many units, and in some cases the entire unit would not be surveyed.

Table III-148. Amount of suitable habitat treatment acres (and road miles) to be surveyed, Priest Lake project area.

Habitat Guild	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Wet Forest Guild	2 (2.9)	2 (2.84)	6 (2.9)	2 (1.22)	0 (1.41)	0 (2.33)
Moist Forest Guild	2,576 (46.38)	2,475 (40.41)	3,168 (53.99)	2,429 (47.52)	1,749 (32.91)	133 (24.69)
Dry Forest Guild	223 (0.37)	223 (0.04)	232 (0.52)	70 (0.21)	212 (0.21)	30 (0.04)
Deciduous Riparian Guild	0	0	0	0	0	0
Peatland Guild*	~15	~15	~15	~15	~15	0
Subalpine Guild	0	0	0	0	0	0
Cold Subalpine Guild	0	0	0	0	0	0
No Data	115 (1.81)	115 (1.49)	118 (2.4)	114 (1.74)	65 (1.57)	5 (0.90)
Total by Alternative	2,926 (51.46)	2,825 (44.78)	3,534 (59.81)	2,625 (50.69)	1,971 (36.10)	168 (27.96)

**Peatland habitat in the vicinity of proposed units would be surveyed to ensure appropriate buffers from harvest activity*

In addition, surveys for project-related activities which may have an adverse impact on sensitive plants or highly suitable habitat would be conducted prior to implementation of those activities. Specific protection measures, as detailed in Chapter II, would be implemented to minimize impacts to any newly documented population and its habitat.

Consistency With the Forest Plan and Other Applicable Regulatory Direction

A Forest Plan management goal is to "manage habitat to maintain populations of identified sensitive species of animals and plants" (Forest Plan, II-1). A Forest Plan standard for sensitive species is to "manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations which could lead to federal listing under the Endangered Species Act" (Forest Plan, II-28). The Forest Plan also identifies the need to "determine the status and distribution of Threatened, Endangered and Rare (sensitive) plants on IPNF" (Forest Plan, II-18). All alternatives proposing harvest activities, with the requirements for surveys and implementation of protection measures as needed, would meet the intent of the Forest Plan. The No Action alternative would also meet the intent of the Forest Plan.

NOXIOUS WEEDS

REGULATORY FRAMEWORK

Federal legislation, regulations, policy and direction that require development and coordination of programs for the control of noxious weeds, and evaluation of noxious weeds in the planning process include: The National Forest Management Act (1976); the National Environmental Policy Act (1969); Forest Service Manual (Chapter 2080, as amended, 1995); Executive Order #13112 (February 1999); Idaho Panhandle National Forests, Forest Plan (1987); and The Idaho Panhandle National Forests Weed Pest Management EIS (1989).

The Forest Service Handbook on Forest Pest Management defines a strategy for managing pests, including noxious weeds, as "A decisionmaking and action process incorporating biological, economic, and environmental evaluation of pest-host systems to manage pest populations" (FSH 3409.11, 6/86). This strategy is termed Integrated Pest Management (IPM). President Clinton signed Executive Order #13112 on February 3, 1999 "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological and human health impacts that invasive species cause...". The Forest Plan provides the following direction for implementing an Integrated Pest Management program: "Noxious weed control will be based on an integrated pest management approach, which includes but is not limited to the current practices of inventory, monitoring, some hand-pulling, and some biological control. Noxious weed control will be conducted in cooperation with counties, other agencies, and private landowners." The overall IPNF strategy is to contain weeds in currently infested areas and to prevent the spread of weeds to susceptible but generally uninfested areas. The 1989 Final Environmental Impact Statement for Weed Pest Management (Idaho Panhandle National Forests) describes the management strategy. Application of an integrated weed management program within the Priest Lake Ranger District has been addressed in the Priest Lake Noxious Weed Control Project Final EIS (USDA 1997).

Noxious weeds are those plant species that have been officially designated as such by federal, State or County officials. In *Weeds of the West* by Whitson et al. (1992), a weed is defined as "a plant that interferes with management objectives for a given area of land at a given point in time." The Federal Noxious Weed Act of 1974 defines a noxious weed as "a plant which is of foreign origin, is new to, or is not widely prevalent in the United States, and can directly or indirectly injure crops or other useful plants, livestock or the fish and wildlife resources of the United States, or the public health" (P.L. 93-629). The Idaho Noxious Weed Law defines a "noxious weed" as any exotic plant species that is established or that may be introduced in the State which may render land unsuitable for agriculture, forestry, livestock, wildlife, or other beneficial uses and is further designated as either a State-wide or County-wide noxious weed (Idaho Code 24 Chapter 22).

The state of Washington has developed a noxious weed list "...of those plants which the State noxious weed control board finds to be highly destructive, competitive, or difficult to control by cultural or chemical practices..." The state further categorizes weed species as follows: those which pose a serious threat to the state are listed as Class A; those which pose a serious threat to a region of the state are listed as Class B. Class B 'designate' species are those Class B weeds for which all seed production can be prevented within one year. Any other noxious weeds are listed as Class C.

Both Federal and State laws define noxious weeds primarily in terms of interference with commodity uses of the land. However, the impacts of weeds on non-commodity resources such as water quality, wildlife and natural diversity are of increasing concern.

AFFECTED ENVIRONMENT

Characterization

The recent scientific assessment of the Interior Columbia Basin found that herbaceous and shrub wetland vegetation types in the Upper Columbia River Basin (including riparian habitats) have declined in area from historical conditions, in part due to invasion by certain noxious weed species (Quigley and Arbelbide 1997).

Wetland habitat in the analysis areas is also vulnerable to decline from encroaching weeds. Rangelands and dry forest types within the analysis areas and surrounding region were described in the above assessment as having low ecological integrity, again in part due to noxious weed invasions (Quigley, Haynes et al. 1996).

The spread of noxious weeds can primarily be attributed to human-caused dispersal such as vehicles and roads (Roche and Roche 1991), contaminated livestock feed, contaminated seed, and ineffective revegetation practices on disturbed lands (Callihan et al. 1991). Vallentine (1988) explains that some of the worst noxious plant problems are caused by weed species such as leafy spurge, Canada thistle, the knapweeds, and dalmatian toadflax. The introduction of these and other noxious weeds has occurred throughout the Priest River subbasin, especially along major highways and travel routes, and areas within the forest that have experienced disturbance from intense recreation, road construction, and timber harvest activities (USDA 1997). Non-native species can impact the native flora and reduce native biodiversity, especially in diverse habitats like riparian zones, sensitive communities like wetlands, or inherently rare plant communities in peatland fens and seeps.

In disturbed forested habitats, most weed species tend to proliferate in early successional stages and are reduced in density as canopy cover closes (Zack 1999). However, in the interim, these transitory populations serve as seed sources for continued species expansion. Some species, such as spotted knapweed, produce large quantities of seed, which may remain dormant in the soil for many years until disturbance from fire, timber harvest or other disturbance provides favorable conditions for their germination and growth.

Existing Condition

Information on existing weed infestations was derived from previous noxious weed surveys within the analysis areas. Most infestations are concentrated along road corridors, with occurrences of some weed species in the general forest. Infestation levels in the analysis areas vary from scattered isolated occurrences to large contiguous populations of one or more species.

The following have been identified as weed species of concern:

- meadow hawkweed (*Hieraceum pratense*)
- orange hawkweed (*Hieraceum aurantiacum*)
- spotted knapweed (*Centaurea biebersteinii*)
- goatweed (*Hypericum perforatum*)
- Canada thistle (*Cirsium arvense*)
- yellow starthistle (*Centaurea solstitialis*)
- common tansy (*Tanacetum vulgare*)
- houndstongue (*Cynoglossum officinale*)
- musk thistle (*Carduus nutans*)
- bull thistle (*Cirsium vulgare*)
- diffuse knapweed (*Centaurea diffusa*)
- purple loosestrife (*Lythrum salicaria*)
- dalmatian toadflax (*Linaria dalmatica*)

Documented weed infestations within the nine analysis areas are addressed in the Priest Lake Noxious Weed Control Project Final EIS (USDA 1997). Approximately 261 acres of infestation are known within the analysis areas. Weed species known to occur include Canada thistle, common tansy, spotted knapweed, goatweed, meadow hawkweed, houndstongue, dalmatian toadflax and sulfur cinquefoil.

Vegetative communities within the Priest River subbasin vary from dry and semi-dry to moist forest habitats and wetlands. A description of these communities can be found in Appendix C, along with a discussion of these communities' susceptibility to weed invasions. Table C-1 in Appendix C, adapted from the recent scientific assessment of the Interior Columbia Basin, displays susceptibility of the Priest River subbasin project area's major vegetative cover types to invasion by several weed species of concern.

A substantial amount of recent bark beetle activity and the majority of proposed treatments are in the Douglas-fir forest cover type, with some activity in ponderosa pine, grand fir, cedar, hemlock, western larch and lodgepole pine cover types.

As shown in Table C-1, certain broad-scale cover types have a high degree of vulnerability to invasion by several weed species. A "high" risk rating indicates that a particular weed can successfully establish and become dominant in a cover type in the absence of intense or frequent disturbance. Weed species considered invaders in some of the beetle-affected forest cover types include spotted knapweed, diffuse knapweed, musk thistle, bull thistle, Canada thistle and sulfur cinquefoil.

Other weed species are considered colonizers, able to invade and establish in certain cover types after soil disturbance or canopy removal. Beetle-affected forest cover types within the analysis areas fall into this "moderate susceptibility" category for many weed species of concern, including oxeye daisy, dalmatian toadflax, orange and meadow hawkweeds, leafy spurge and yellow starthistle.

Based on the information on susceptibility of broad scale cover types, the table below represents the amount of habitat vulnerable to invasion by one or more weed species. Coarse habitat and cover type query results used for the table are located in the project file. Acres under Alternative A are the cover types predicted to result from beetle activity alone. Acres under the action alternatives are those cover types predicted to result from proposed treatments, and are a subset of those under Alternative A.

Table III-149. Acres of highly susceptible* vegetative cover types, by alternative.

Forest Cover Type	Alt A	Alt B	Alt C	Alt D	Alt E	Alt. F	Alt. G
Western redcedar	2,614	293	293	581	321	163	0
Grand fir/hemlock	2,637	746	770	1,218	1,194	751	0
Interior Douglas-fir	4,514	931	931	1,604	1,643	981	0
Interior ponderosa pine	137	2,259	2,259	2,624	1,324	1,580	366
Spruce/subalpine fir	13	3	3	3	3	0	0
Western larch	316	1,009	1,025	1,292	498	484	0
Lodgepole pine	37	5	5	12	5	0	0
No data	356	0	0	0	0	0	0
Total acres	10,624	5,246	5,286	7,334	4,988	3,959	366

**Highly susceptible cover types are those which have a "high" risk rating for weed invasion-- in which one or more weed species may invade in the absence of intense or frequent disturbance.*

ENVIRONMENTAL CONSEQUENCES

Methodology

Analysis was conducted using results of past noxious weed surveys, current distribution of weed species in habitats similar to those found in the proposed treatment sites, types of proposed treatments and the risk of weed spread, and introduction of new weed invaders from the proposed activity, based on current knowledge and professional judgement.

Indicators used to measure impacts on weed spread and introduction include the number of acres proposed for ground-based timber harvest and/or fuels treatment, the number of miles of proposed new road construction and reconstruction, and the proximity of proposed treatment areas to known weed infestations.

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

For noxious weeds direct, indirect and cumulative effects were not addressed at the analysis area level. All effects were addressed at the project area level.

Direct, Indirect and Cumulative Effects at the Priest Lake Project Area Scale

Effects Common To All Alternatives

Direct and Indirect Effects

Many weed species generally invade areas of disturbed soil, understory vegetation and canopy. However, even in the absence of soil or vegetation disturbance, some weeds will invade if tree canopy cover is significantly reduced. As beetle-killed trees lose their needles, areas with significant canopy reduction (either from beetle kill alone or beetle kill plus timber harvest) would be susceptible to invasion by oxeye daisy and common tansy in particular. Thus, canopy reduction resulting from beetle kill only or beetle kill plus timber harvest would have a similar impact on weed spread. Even in areas proposed for regeneration harvest under the action alternatives, additional canopy reduction from harvest of associated green trees would be negligible with regard to the risk of weed spread.

A few weed species will invade undisturbed habitats. Any suitable forest cover types (see the above Table) adjacent to existing infestations of spotted knapweed, Canada thistle, bull thistle and sulfur cinquefoil are susceptible to invasion by these species under any alternative. There would be a slightly increased risk of weed spread during and for a short time following project implementation in those areas proposed for selective harvest under all action alternatives. Where harvest would be ground-based, the risk of weed spread would be higher than where helicopter logging would occur.

Cumulative Effects

For the above weed species the long-term difference between alternatives would be minimal. Overall, for all alternatives, cumulative effects on oxeye daisy, common tansy, spotted knapweed, Canada thistle, bull thistle and sulfur cinquefoil would be predicted to be moderate in habitats susceptible to invasion by these weeds.

Foreseeable Actions

A list of reasonably foreseeable and ongoing projects in Priest Lake Ranger District is included in Appendix E. Projects include timber harvest on federal, State and private lands, repairs and resurfacing on county and Forest Service roads, wildlife burns, recreation and road access, grazing allotments and slash disposal.

Implementation of foreseeable future and current actions on National Forest lands will, in most cases, have no additional impacts on the risk of weed spread, since the Priest Lake Ranger District is committed to implementing treatment and prevention practices as described in the Priest Lake Noxious Weed Control Project EIS (USDA 1997) on all current and future projects which propose ground or vegetation disturbance and/or canopy removal.

Planned and proposed burning of 154 acres to enhance big game and caribou habitat would contribute a low level of cumulative impacts on the spread of goatweed. Prevention and treatment practices required by the Priest Lake Noxious Weed Control Project EIS (USDA 1997) would minimize cumulative effects from these projects.

Effects Common To All Action Alternatives

Direct and Indirect Effects

The risk of weed spread in susceptible habitat proposed for underburning would vary for different plant communities. Those areas where shrub species are predicted to dominate would be at lower risk, while grass and forb-dominated communities would be at higher risk for weed invasion. A slight increase in the risk of weed spread is predicted for mechanical fuels treatment. Drier sites in the Upper West Branch, Quartz, and Lakeface-Granite analysis areas in particular are vulnerable to expansion of existing populations of goatweed following timber harvest and underburning. Sites proposed for timber harvest and underburning in the Lower West Branch analysis area would be vulnerable to expansion of the known population of houndstongue. In all analysis areas, there would be an increase in the risk of spread of orange and/or meadow hawkweed from existing infestations. At the same time, treatment of fuels under the action alternatives would reduce the intensity of

future wildfires (see Fire/Fuels Environmental Consequences). Reducing heavy fuels would lower the long-term risk of weed spread into severely burned stands.

There would be an increased risk of weed spread following road reconstruction. With regard to the risk of weed spread, the difference in the amount of reconstruction between the action alternatives is very small. Vehicles using the roads could import new species into proposed treatment areas and expand existing populations. Seeding disturbed cut and fill banks with a temporary seed mix during project implementation would minimize this risk. Closure of all reconstructed roads followed by seeding with native and desired non-native species after completion of harvest and project-related activities would reduce the risk of weed spread over time to current levels. The project area would be evaluated for opportunities to treat weed infestations if KV funding becomes available with implementation of an action alternative.

Cumulative Effects

Given the species' pervasiveness, cumulative effects for goatweed and its potential for spread into treated areas would be moderate under all action alternatives. Infestations of houndstongue and orange and meadow hawkweed in the analysis areas are smaller and more scattered. Thus, with implementation of proposed prevention and treatment practices, cumulative effects on the spread of these species would be predicted to be low. In addition, for all action alternatives, the risk of invasion of new weed species would be low.

While existing infestations of certain weed species may continue to increase on federal and adjacent private lands, proposed activities in the action alternatives would minimize the risk of weed spread through application of Noxious Weed Features outlined in Chapter II. However, the Forest Service has no control over activities on private lands; weed introduction and spread are likely occurring on those lands.

Alternative A (No Action)

Direct and Indirect Effects

The impacts of Alternative A on noxious weed infestations were discussed above under Effects Common to All Alternatives. There would be no additional direct or indirect impacts to weed infestations or risk of weed spread, since management activities would not change from current levels.

Cumulative Effects

Under this alternative, future wildfires in beetle-affected areas would be of a higher intensity due to the resulting high level of untreated fuels (see Fire/Fuels Environmental Consequences). The risk of weed spread following such an event, were it to occur, would be extremely high. It would be difficult at best to predict where and when such an event would occur. Cumulative effects related to weed spread from a future stand-replacing wildfire would be low to moderate depending on the occurrence in susceptible habitat and proximity of a high-intensity wildfire to existing weed infestations.

Based on the best available information, in the absence of wildfire, cumulative effects on the spread of existing scattered populations of houndstongue and orange and meadow hawkweed would be predicted to be low, while cumulative effects on the spread of the pervasive goatweed would be moderate under this alternative.

Effects Common To Alternatives B, D, E And F

Direct and Indirect Effects

There would be an increased risk of weed spread and invasion of new species following new road construction. With regard to the risk of weed spread, the difference in the amount of new construction between these alternatives is minimal. Vehicles using the roads could import new species into proposed treatment areas and expand existing populations. Seeding disturbed cut and fill banks with a temporary seed mix during project activities would minimize this risk.

Observations of recent timber sales within similar cover types indicate that preventive seeding and road closures are effective at reducing weed spread. Jeru Ridge, Gold Hill and Grouse Mountain (Sandpoint Ranger District); and North Fork Granite Timber Sales (Priest Lake Ranger District) are examples of recent successes in weed prevention along road corridors using various combinations of treatment, preventive seeding and road closures. Results of weed surveys and monitoring for those projects are located in the project file.

Cumulative Effects

Cumulative effects would be those described under Effects Common to All Alternatives. Closure of all new roads followed by seeding with a permanent seed mix after completion of harvest and project-related activities would reduce the risk of weed spread and new invasions, so that cumulative effects from new road construction would be low.

<u>Alternative B</u>

Direct and Indirect Effects

There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on approximately 2,072 acres. There would be a slight increase in the risk of weed spread from ground-based selective harvest on approximately 1,657 acres. A substantial risk of the spread of goatweed from underburning on approximately 3,271 acres would result, while a slight increase in risk from mechanical fuel treatments on approximately 542 acres would occur. Weed treatment and prevention practices as proposed (Features Common to All Action Alternatives) would reduce, but not eliminate, this risk.

Cumulative Effects

Cumulative effects would be those discussed above under Effects Common to All Alternatives and Effects Common to Alternatives B, D, E and F.

<u>Alternative C</u>

Direct and Indirect Effects

Because no new road construction would occur, there would be no new weed corridors to facilitate weed spread. In addition, fewer acres would be treated using ground-based harvest systems. There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on approximately 1,282 acres. There would be a slight increase in the risk of weed spread from ground-based selective harvest on approximately 1,227 acres. A substantial risk of the spread of goatweed from underburning on approximately 3,233 acres would result, while a slight increase in risk from mechanical fuel treatments on approximately 518 acres would occur. Weed treatment and prevention practices as proposed (Features Common to All Action Alternatives) would reduce, but not eliminate, this risk.

Cumulative Effects

Cumulative effects would be those discussed above under Effects Common to All Alternatives.

<u>Alternative D</u>

Direct and Indirect Effects

There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on approximately 2,557 acres. There would be a slight increase in the risk of weed spread from ground-based selective harvest on approximately 1,951 acres. A substantial risk of the spread of goatweed from underburning on approximately 3,885 acres would result, while a slight increase in risk from mechanical fuel treatments on approximately 475 acres would occur. Weed treatment and prevention practices as proposed (Features Common to All Action Alternatives) would reduce, but not eliminate, this risk.

Alternative D has the highest risk of weed spread of any of the action alternatives, due to the amount of proposed road construction and ground-based timber harvest and fuels treatments.

Cumulative Effects

Cumulative effects would be those discussed above under Effects Common to All Alternatives and Effects Common to Alternatives B, D, E and F.

<u>Alternative E</u>

Direct and Indirect Effects

Effects of harvest and fuel treatment as proposed under this alternative would be only slightly higher than with the No Action Alternative. There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on approximately 1,422 acres (in many beetle-affected stands, Douglas-fir mortality is so high that even selective harvest of dead and dying trees only would result in a regeneration harvest). There would be a slight increase in the risk of weed spread from selective harvest on approximately 2,117 acres. A substantial risk of the spread of goatweed from underburning on approximately 2,128 acres would result, while a slight increase in risk from mechanical fuel treatments on approximately 502 acres would occur. Weed treatment and prevention practices as proposed (Features Common to All Action Alternatives) would reduce, but not eliminate, this risk.

Cumulative Effects

Cumulative effects would be those discussed above under Effects Common to All Alternatives and Effects Common to Alternatives B, D, E and F.

<u>Alternative F</u>

Direct and Indirect Effects

Effects of harvest and fuel treatment as proposed under this alternative would be similar to those of Alternative B. There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on approximately 1,103 acres (in many beetle-affected stands, Douglas-fir mortality is so high that even selective harvest of dead and dying trees only would result in a regeneration harvest). There would be a slight increase in the risk of weed spread from selective harvest on approximately 1,585 acres. A substantial risk of the spread of goatweed from underburning on approximately 1,985 acres would result, while a slight increase in risk from mechanical fuel treatments on approximately 337 acres would occur. Weed treatment and prevention practices as proposed (Features Common to All Action Alternatives) would reduce, but not eliminate, this risk.

Cumulative Effects

Cumulative effects would be those discussed above under Effects Common to All Alternatives and Effects Common to Alternatives B, D, E and F.

<u>Alternative G</u>

Direct and Indirect Effects

Effects of fuels treatment as proposed under this alternative would be only slightly greater than under the No Action Alternative. There would be an increased risk of weed spread into underburned areas on approximately 303 acres. Although a substantial risk of the spread of goatweed in underburned areas would result, the treatment area would be relatively small. Weed treatment and prevention practices as proposed (Features Common to All Action Alternatives) would reduce, but not eliminate, the risk of weed spread.

Alternative G has the lowest risk of weed spread from soil or vegetation disturbance of any of the action alternatives, due to the small amount of beetle-affected areas that would be treated.

Cumulative Effects

Cumulative effects of this alternative would be those discussed above under Effects Common to All Alternatives and similar to cumulative effects of Alternative A.

Effects Of Opportunities

Watershed restoration projects such as road obliteration, removal or improvement of stream crossings and placement of instream structures to benefit fish habitat could increase the risk of weed spread and of new invasions through moderate levels of soil and vegetation disturbance. Weed treatment and prevention practices as proposed (Features Common to All Action Alternatives) would reduce this risk. In addition, removal of problematic road segments would reduce or eliminate chronic erosion of topsoil which can discourage establishment of native species and encourage invasion of weed species which readily establish on disturbed soils. Removal of unneeded roads and road segments also reduces the availability of travel corridors which hasten the spread of weeds from vehicle traffic.

Weed treatment and prevention projects would be conducted under the guidelines of the Priest Lake Noxious Weed Control Project EIS (USDA 1997). Effectiveness of the available treatment methods in controlling weeds were addressed in that document.

Timber stand improvement work would have no appreciable effect on the spread of weeds.

Consistency With the Forest Plan and Other Applicable Regulatory Direction

According to the Idaho Panhandle Forest Plan (1987) direction, infestations of many noxious weed species, including knapweed, goatweed and common tansy, are so widespread that control would require major programs that are not possible within expected budget levels (Forest Plan, p. II-7). Forest Plan direction is to "provide moderate control actions to prevent new weed species from becoming established". All alternatives proposing harvest activities within the IPNF, with the provisions for minimizing weed spread (Features Common to All Action Alternatives), would meet the intent of the Forest Plan. The No Action alternative would also meet the intent of the Forest Plan.

WATERSHED

REGULATORY FRAMEWORK

The Forest Plan for the Idaho Panhandle National Forests provides direction regarding the management of land to enhance and protect aquatic resources. In addition to direction established by the Forest Plan, all activities would comply with rules and regulations governing the state in which the proposed activity would occur. Activities are proposed in both the States of Idaho and Washington.

The Coeur d'Alene River Basin and the St. Joe River Basin are the two principle sources of Coeur d'Alene Lake, which in turn supplies the Spokane River of the Columbia. The Priest River Basin, Pend Oreille Lake, and the Pend Oreille River Face all supply the Pend Oreille River of the Columbia. Beneficial water uses include local public water supplies and recharge to major aquifers; habitat for several species of native fish in the streams and rivers, as well as an important sport fishery in Coeur d'Alene and Pend Oreille Lakes; extensive riparian and other wetland habitats that are used by fish, wildlife, sportsmen, and that serve functionally to moderate flooding and ensure quality water; downstream irrigation water supplies; downstream power production; and recreation. Beneficial uses are protected by Best Management Practices (BMPs) as identified in the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code) and by the Washington Forest Practices Rules and Regulations (Title 222 WAC). A listing of the Forest Service Best Management Practices (FSH 2509.22) applicable to this project are located in the project file.

AFFECTED ENVIRONMENT

Pre-Settlement Conditions

When the first settlers arrived in the 1800's, the landscape of the Priest River Basin was quite different than it is today. The Basin had been shaped by a long history of natural events including fires, floods, glaciers, and various geologic processes. The streams and rivers of the Priest River Basin had developed in response to these naturally-occurring disturbance patterns. Geologically, belt rocks and granite dominate most of the basin. The northern half of the Priest River basin was continentally glaciated. Within the project area, only the Watson area was glaciated. Silt and sand deposits from glacial lakes are also prominent in the valley bottoms of the Priest River drainage. Hillslope soils developed from belt rock types are less prone to erosion and mass movement than granitic parent material. Historic vegetation contributed to stable, healthy streams. Streamside (riparian) areas were well-vegetated with large conifers and other plant communities. These communities had well-developed root systems which held stream banks together during high flows while providing shade and cover for the native fish and other aquatic life. Large woody debris in the streams stored sediment, reduced stream velocity during high flows, and provided instream cover for fish and other organisms. Historically there were large contiguous wetlands scattered throughout the basin. Beavers played an important role in their maintenance and development. Together, these factors helped maintain healthy aquatic systems. The streams and rivers were well-adjusted to natural disturbances, particularly floods and fires.

Flooding has always been important in the Priest River Basin. Historically, floods of some magnitude occurred one to four times in any ten year period. Larger floods occurred less frequently. Rain-on-snow events, which contributed to many of the larger floods, were very important hydrological processes although less so than in the Coeur d' Alene basin. Rain-on-snow events occur when a large warm, moisture-laden air mass moves in over an extensive snowpack that is already on the verge of melting. As the warm airmass moves upslope it condenses forming rain and fog. Because they are above the freezing point, rain and fog can trigger very rapid snowmelt, and the combined effect of rain and melted snow produces very high runoff in a short time. A large percentage of the mountainous area of northern Idaho lies between 3,000 to 4,500 feet in elevation, which is very susceptible to rain-on-snow events.

Fires of mixed severity occurred with some regularity throughout the project area. Periodic stand replacing forest fires also contributed to flooding. High intensity fires such as those that occurred in the late 1800's, and 1930's in particular would trigger rapid changes in streamflow, sediment loading and wood inputs to streams. In the period between catastrophic fires, streams were able to re-adjust to a more stable condition.

Although floods occurred periodically, the streams and rivers had adjusted accordingly and remained relatively stable. Populations of fish and other aquatic organisms in the streams were also well-adapted to these periodic disturbances and were not usually adversely affected by them.

Post-Settlement Conditions

Following settlement in the late 1800's, the nature of disturbance changed dramatically throughout the basin. Disturbance from mining, timber harvest, road-building, grazing and other land management activities were added to the disturbances from natural events. Roads were constructed up the major stream corridors and eventually into the interior of the basin. Log drives were also common on the larger streams such as Priest River and Lower West Branch and continued through the mid-1950s. Aggressive fire suppression activities were developed and improved on beginning in the early 1900's. These activities and others dramatically altered the disturbance regime in the Priest River basin.

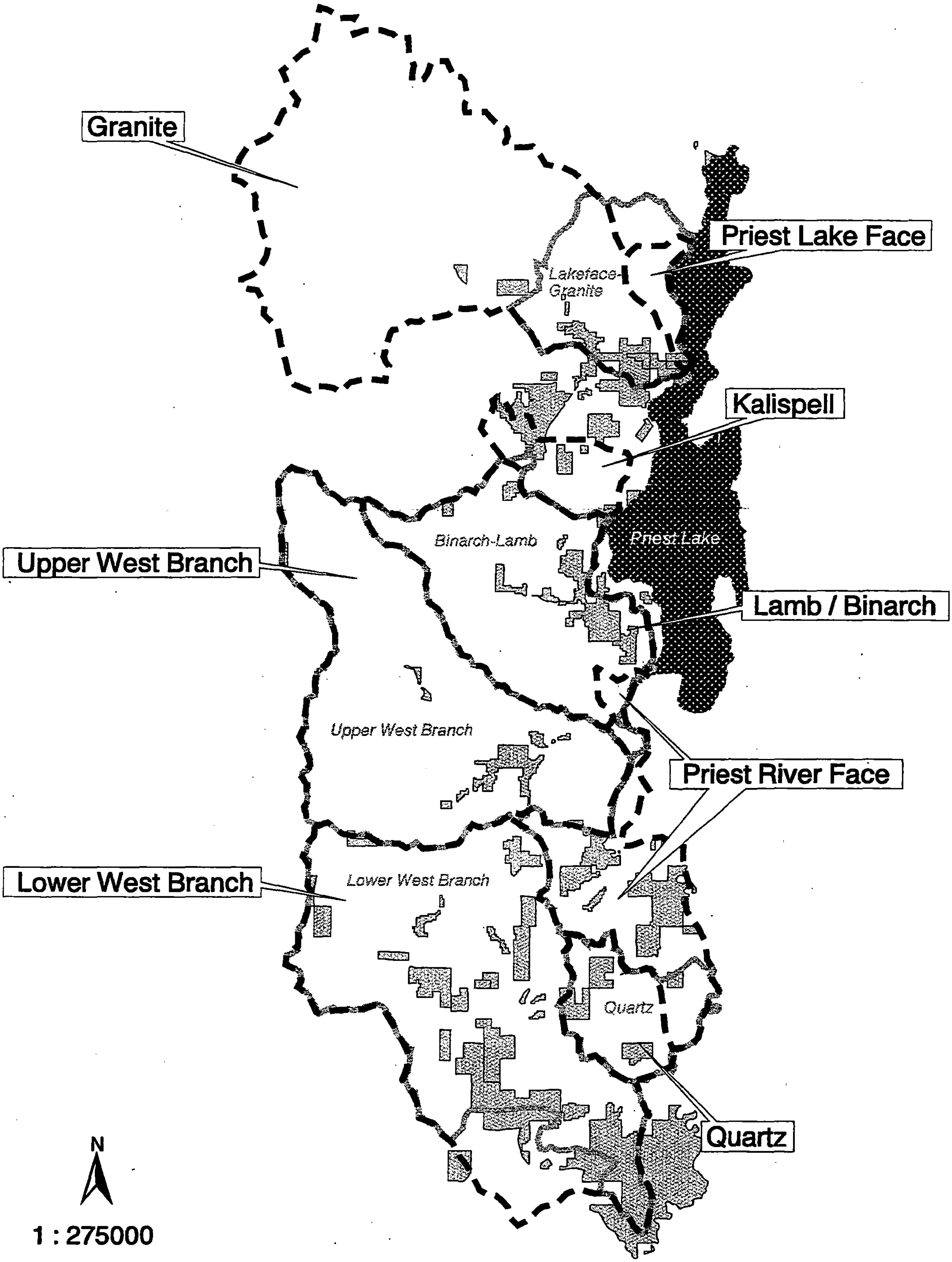
Hydrologically, streams were not adapted to the combined effects of natural disturbance, land management and fire suppression. On the hillsides, extensive timber harvest would cause large quantities of water, previously used by the trees, to remain in the ground or runoff. Miles of associated road networks on the hillsides and in the valley bottoms delivered this excess water more quickly to downstream reaches. In addition, the impact of rain-on-snow events became more severe because openings in timber stands from fire, windthrow, disease and timber harvest were most susceptible to rapid snowmelt conditions. The result was higher peak spring flows and greater flow volumes than had occurred previously.

Valley bottom areas were also affected. Low-lying riparian areas became some of the most altered landscapes in the Priest River Basin. Valley bottoms, which provided natural travel corridors in the mountainous terrain, were generally the first to be settled and converted to agricultural and other uses. The removal of beaver by trapping along with ditching to increase agriculture lands resulted in the loss of large areas of wetland. Extensive harvest occurred in the large stands of cedar, white pine, larch and cottonwood along the streams and rivers. This loss of large wood and wetlands in the valleys and streams resulted in degraded fish habitat from loss of in-stream cover, loss of shade and other factors.

In addition to timber harvesting, many roads were built directly adjacent to the streams and rivers. In many cases, this reduced the streams ability to safely transport water, sediment and other material during flood events. Constriction from encroaching roads also resulted in bank erosion and various forms of stream channel adjustment. Further impacts occurred when streams themselves were used to transport logs to the mill. Early logging and transportation practices included splash dams, flumes, chutes, and other mechanisms to move logs downstream. These practices altered natural flow regimes, channelized and eroded stream banks, compacted soils and often resulted in extensive and long-term loss of large wood to the streams.

The combined effect of natural and management-related disturbance has had an adverse effect on many streams in the Priest River Basin. From both a scientific and management standpoint, some of the most important processes affecting streams are the failure of road fills and stream crossings in close proximity to stream channels and the direct hydraulic modification of the stream. Therefore, the watershed improvements proposed in this document will focus on the effects of roads (both riparian and hillslope) and related impacts. The analysis presented in this environmental impact statement will also address the potential for changes in streamflow as a result of the bark beetle outbreak.

Analysis Watersheds Versus Priest Project Areas



EXISTING CONDITIONS

Introduction

An assessment of existing conditions is critical to environmental analysis because it both describes the current condition of the project area and provides a basis for comparing the effects of management alternatives. This existing condition discussion was developed from many information sources including field surveys, aerial photographs, Geographic Information Systems (GIS), hydrologic response techniques and models such as WATSED, and other watershed and aquatic data derived by the forest service and its partners. The assessments used as a general model the principles and processes in the *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis* version 2.2, August 1995. (Regional Interagency Executive Committee and the Intergovernmental Advisory Committee, Forest Service and other federal agencies, copies available from Regional Ecosystem Office, PO Box 3623, Portland, Oregon 97208.)

The project areas were first subdivided into manageable watershed units for analysis. Two types of units were identified: true watersheds and composite watersheds. True watersheds are areas of land in which all of the streams are interconnected and drain through a single point. For example, the Granite Creek watershed consists of Fedar Creek, Watson Creek, Athol Creek, Sema Creek, South Fork Granite Creek and all of the other small drainages that contribute water to Granite Creek. A watershed can also drain into a lake, such as Priest Lake. True watersheds identified in the project area include Granite Creek, Upper West Branch Priest River, Quartz Creek, Lower West Branch Priest River, Binarch Creek, Tango Creek, and Lamb Creek.

For purposes of analysis, some "composite watersheds" were also used. They consist of smaller independent watersheds grouped together. Streams in composite watersheds are not as directly interconnected as those in true watersheds. Composite watersheds in the project area include the Priest Lake Face drainages, and Priest River Face drainages.

The focus of this hydrologic assessment revolves around two distinctly separate larger geographical areas. For ease of discussion these two larger geographical areas will be referred to as the Priest River basin and the Newport area. The Priest River basin geographical area includes several of the larger tributaries to Priest River (for example: Lower West Branch, Upper West Branch, Binarch Creek and Lamb Creek) as well as several tributaries to Priest Lake (Granite Creek, Kalispell Creek and Tango Creek). The Newport Area refers to a geographical area composed of several drainages that ultimately flow into the Pend Oreille River in the vicinity of Newport, Washington.

The Douglas-fir Beetle Project Analysis Area involves some watersheds addressed in the Geographic Assessment of the Pend Oreille River Basin (USDA Forest Service, in progress). In this assessment area, there are several primary hydrologic processes that tend to dominate the watersheds and their associated stream networks behaviors, several of which are reflected to varying degrees in this project area.

Watershed Processes

There are several primary physical processes that affect the behavior of a watershed and its associated stream network, Several of these watershed processes have affected the existing condition of the watersheds in the Priest River basin and Newport area.

1. ***Water yield changes through vegetative changes:*** Water yield describes the changes in the rate, frequency, and timing that a watershed exhibits in response to runoff from hydro-climatic events such as rainfall and snow melt. Changes in peak flow is often used to measure the effects of vegetative changes on water yield. Patterns of regeneration harvest, large stand-consuming fires, and forest insects and diseases can alter snowmelt patterns because of vegetation changes on the slopes, These changes in snowmelt patterns can result in higher peak flows earlier in the spring.

2. ***Increased peak flows through extended channel networks:*** Forested watersheds like the Priest River typically transport runoff subsurface until it reaches a stream channel. As long as the water movement is subsurface, the rate of movement is relatively slow compared to free water flow on the surface. A watershed has a network of channels that expand in length (and width) as a substantial runoff event occurs. As this network expands, such as during the spring snow melt, not only is more water being moved, but it is also moved faster.

   Roads, (landings and excavated skid trails), especially those on steeper landtypes, have often been excavated to a depth which intercepts the subsurface water. This water flows on the surface until it either infiltrates the ground or reaches a stream channel.

   Many watersheds and subwatersheds of the Priest River system have exceptionally high road densities. Where the associated landtypes are susceptible to interception of subsurface slope water by those roads, there is a potential for substantial expansion of the channel network and contributing areas during runoff-producing events.

3. ***Rain-on-snow events and watershed responses:*** From the North Fork of the Clearwater River to the Canadian border, northern Idaho experiences a strong maritime influence with warm moist weather fronts invading in the winter from the Pacific Coast. These relatively warm and moisture-laden air masses are frequent and have a profound effect on the climate and hydrology of the Priest River basin. As a result, midwinter snowmelt, thaws, and rainfall are common in the region.

   Portions of the Priest River basin are particularly susceptible to rain-on-snow events. In northern Idaho, the snowpack within the 3,000 to 4,500-foot elevation range is most susceptible to rain-on-snow events. Below 3,000 feet, the snow pack often may accumulate and abate several times during the season and not be a substantial contributor to overall basin runoff. In many years the snow pack above about 4,500 feet is usually "cold" and less susceptible to rain-on-snow events.

   Rain-on-snow is a natural process under which the streams of the basin developed. However, within the Priest River basin the dominant channel-forming events are associated with spring runoff. The historic streams of the basin were very stable and resilient because they developed in response to the variability of the climatic processes and the dominant geology of the basin. Rain-on-snow events probably did not cause the loss of main stream equilibrium historically. Changes in vegetation resulting from management or natural events can affect the frequency and magnitude of rain-on-snow events.

4. ***Direct delivery of bedload materials from the hillslopes to streams:*** Perhaps the most important process influencing the Priest River and its tributaries is the failure of roads, road fills, landings, and other encroachments in close proximity to streams. When these fail and the slope is capable of transporting the debris (i.e. on steep slopes or on slopes dissected by frequent streams and draws), sediment and debris is delivered into stream courses.

5. ***Direct riparian and instream disturbances:*** Logging practices and other management activities in riparian areas and stream bottoms have frequently resulted in adverse effects. These activities have caused extensive and long-term loss of large wood-replacing vegetation, stream channelization and changes of alignment, loss of structural components, compaction of soils, and other hydraulic modifications.

   Roads and other facilities in valley bottoms inevitably encroach on the stream channel and its floodplain and low terraces. This encroachment creates a constriction in the normal stream environment. Consequently, large streamflows are forced through a smaller (constricted) channel and floodplain than it was "designed" for after thousands of years of floods. The smaller channel results in deeper water flows causing flooding and an increased velocity of flows. This in turn results in accelerated bed scour and bank erosion. The resulting sediment and can cause abnormal drastic and prolonged channel adjustments

which may even trigger new adjustments downstream. These disturbances cause a loss of stream equilibrium, which is extensive in some tributaries of the Priest River basin.

Current conditions in each of the watersheds are described below. The description of existing watershed conditions includes several terms from the Geographic Assessment:

- ***Properly functioning:*** *Within the scope of this assessment, a properly functioning watershed system is one that is exhibiting dynamic equilibrium characteristics and whose streams are operating and responding appropriately under their current environment. These systems can absorb and respond to disturbances that they have evolved under within their historic range. Typically, parts of these systems, or the system as a whole, can move toward a more stable condition over time following a disturbance (or a series of disturbances) within a certain time period. As a system, these watersheds will not benefit from large scale watershed restoration actions (although local, site specific improvements may be productive.)*

- ***Functioning-at-risk:*** *A watershed system that is functioning-at-risk is one that is essentially still properly functioning. However, it may be exhibiting trends or it may contain known risks that are likely to compromise that status and the ability to fully support beneficial uses in the future. This status may be assigned where the apparent watershed status is uncertain because the complexity of the system and disturbances. These systems are the first priority for large scale watershed system restoration and improvement programs. Such programs will often produce effective and timely responses in the near future.*

- ***Not properly functioning:*** *Watershed systems that are not properly functioning often exhibit rapid adverse trends and may not fully support beneficial uses. These systems may appear to be responding to their own last adjustment, rather than toward stabilizing the last disturbance. They are "out-of-balance" with their environment and may not be in dynamic equilibrium, in periods of at least several decades. These systems are in need of large scale restoration. These watersheds are usually second priority due to limited availability of resources, uncertain technology, and the long time period expected for positive responses.*

Methodology Used to Describe the Existing Conditions

Each watershed or watershed area that was analyzed in the project is characterized in the tables of Watershed Characteristics, Condition Indicators, and Dominant Watershed Disturbances. Each entry section is described here, and a summary of the methods used to derive it. "Watershed" refers to true watersheds that are defined by drainage divides and where surface water flows pass through a single location at the lowest elevation of the affected watershed. In some cases, a project area is delineated by composite watersheds that include several very small adjacent, but independent watersheds or lake face lands. These are referred to as "Watershed *Areas*."

Each of the project areas assessed were analyzed from at least two scales: the local site or tributaries where activities take place; and the cumulative effect watershed. The cumulative effect watershed (or watershed area) is the logical culmination point of water flow where the effects of the distributed project activities could possibly integrate or synchronize over time and space and be addressed cumulatively in a larger watershed. The cumulative effects analysis includes an analysis of past, present, and reasonably foreseeable activities.

In each case, the direct, indirect, and cumulative impacts related to the alternatives of this project on watershed, water, and streams were usually local in nature, and sometimes to the next larger tributary formed by multiple tributaries. In no case will the cumulative effects extend beyond the watershed or watershed areas.

Typically the physical effects of runoff modifications, sediment loading, and water temperature, if they occur in projects of this scale, are immeasurable and/or not observable at large watershed and subbasin scales. This results from desynchronization (individual tributaries respond at different times of the year or may be

slower to respond than others to disturbance events); the inherent large range of variability that watershed processes operate within years and under which they have evolved and adjusted; and the fact that watershed systems are dynamic in nature.

Dynamic watershed systems assimilate and adjust naturally to disturbances. They typically have a tremendous capability to absorb impacts and re-adjust in a relatively short period of time. Some disturbances can alter the rate and magnitude of those adjustments. Those altered adjustment rates, or more frequent adjustments, can affect local beneficial uses. If the adjustment capabilities of the local watershed is "overwhelmed," or multiple local affected tributaries are synchronized, the adjustments begin to take place in the parent watershed.

In every case, the adjustments of the watershed to any effects of the project activities individually or cumulatively are expected to remain within tributaries of the cumulative effect watersheds or watershed areas. No physical response would extend to or be measurable in Priest Lake below the project watersheds, or in Priest River itself below the lake, below the project areas in the lower Priest River, or below its confluence with the much larger Pend Oreille River.

Priest River flows into the Pend Oreille River which eventually combines with the Upper Columbia River far downstream. No effects would reach either point, and no effects of the Priest River projects would combine with the lower Pend Oreille River (Newport Area) and the Coeur d'Alene River District projects at a point lower in the Upper Columbia River.

The following descriptors were used to describe the existing watershed conditions for each watershed in the Watershed Characteristics, Condition Indicators, and Dominant Watershed Disturbances table:

Physical Characteristics

Each watershed or watershed area is listed by its Hydrological Unit code (HUC). The HUC is a hierarchal watershed classification. For example, the "17" in HUC 17010216 represents the Columbia River Basin. Each successive pair of numbers in the HUC represents the next lower hierarchial watershed area. The U.S. Geological Service defines watersheds up to the 8th digit (4 pairs), which is referred to as the "4th code" HUC, which is the subbasin level. Therefore, 17010215 represents the Priest River subbasin. HUC numbers with additional digit pairs indicate watersheds and subwatersheds delineated by the Forests.

The drainage area for the watershed or watershed area is identified in square miles as derived from GIS analyses. Cumulative effects analyses were addressed for the entire watershed at this level. In order to facilitate supportable assessment of forest practices and logging effects, particularly the portion of those assessments that involved watershed modeling, the downstream limit of the analysis watershed was defined at a point where the watershed is essentially defined by National Forest System (NFS) lands. The reason for this adjustment was to maintain the use of the models within the scope that they were calibrated and validated, which is on NFS lands where landtypes have been mapped and disturbance histories (roading and logging) are known to the necessary resolution. The interpretations of modeled estimates for NFS watersheds are combined with other data, analyses, inventories, and other information and professional judgement to address the entire watershed, including that portion downstream of NFS lands.

All National Forest lands have been classified into units known as landtypes which are based on local geomorphology, hydrology, and soils characteristics. Landtypes address physical responses to forest practices, including road development, logging, and fire. Each watershed or watershed area is characterized by the percent of the drainage area that is made up of sensitive landtypes (those that are more susceptible to mass erosion and increased sediment delivery to streams). As a point of reference, watersheds with more than about 30% sensitive landtypes are often very sensitive to cumulative disturbances.

Portions of the Inland Northwest are influenced by the maritime climate from the West Coast. This climatic characteristic, along with local orographics and elevation, often result in winter snowpacks that rapidly respond to warm moist mid-winter storms. These responses are rapid melt and runoff. If a watershed is typically dominated by this snow characteristic, then the watershed is often subject to flashy and rapid mid-winter runoff. Therefore, the percentage of the watershed that supports this sensitive snowpack is a measure that partially characterizes the overall sensitivity of the watershed. As a point of reference, watersheds with a small proportion of sensitive snowpack (less than 30%) do not appear to be very responsive to rain-on-snow events at the watershed scale. Watersheds with a large proportion (greater than 70%) of sensitive snowpacks are often highly volatile and are very sensitive to other disturbance regimes in terms of runoff from the stream system.

The sensitive landtypes and sensitive snowpack parameters characterize the inherent sensitivity of each watershed based on the natural conditions under which it evolved. These parameters do not change with forest development, and therefore are not carried into the Environmental Consequences section of Chapter III. They do, however, provide a basis and reference point for the watershed effects estimated in the consequences section, as well in the design and location considerations of each alternative.

Qualifications

Section 303(d) of the Clean Water Act[1] requires the States to list water bodies (stream segments and lakes) that do not support beneficial uses, even though BMPs are employed. These are identified as **Water Quality Limited.** If any part of a watershed contains one or more segments that are listed as Water Quality Limited, that is indicated in the table.

The apparent watershed status has been estimated based on known conditions in the watershed, its sensitivity and resilience, and the disturbance history in the drainage. The three descriptors "properly functioning" (PFC), "functioning at risk" (FAR), and "not properly functioning" (NPFC) were described in the previous section and are noted in the table.

In this assessment, tributaries to the analysis watershed or watershed area were used as the primary basis for the analysis of the entire watershed. This may be due to land ownership, data limits, non-forest, and areas dominated by lake or large river lands. The analysis addresses the entire watershed or area, and the more intensely studied subwatersheds used for analysis are listed.

Hydrological Regime

The level of estimated peak flow that is expected to occur on the average about every two years (Q_2) is listed for characterization as cubic feet per second per square mile of drainage area.

The anticipated runoff modification and equivalent clearcut area for a watershed or watershed area were derived from methods documented in the R1/R4 Sediment Guides[2] and the Watbal Technical User Guide[3]; and calibrated on the Idaho Panhandle National Forests. The current runoff modification is shown as a percent of the "natural" peak month discharge and reflects watershed climate patterns and disturbance history. The equivalent clearcut area is used to express the percentage of hydrologic openings in a watershed and accounts for vegetative recovery since the initial disturbance.

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[1]*Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, PL 92-500.*

[2]*Cline, Cole, Megehan, Patten, and Potyondy, October 1981. Guide for Predicting Sediment Yields from Forested Watersheds, USDA Forest Service, Northern Region and Intermountain Region.*

[3]*Watershed Response Model for Forest Management: WATBAL Technical User Guide, Rick Patten, 1989, Clearwater National Forest.*

Watershed Hydrologic Response Estimates and WATSED

WATSED is an analysis tool that spatially and temporally organizes some typical watershed response relationships as a result of forest practices. The estimated responses are combined with other sources of information and analyses to determine the findings of probable effects.

Sediment yield (sediment load modification) and peak flow (runoff modification) serve as relative indicators of potential hydrologic responses in the watershed with a specified series of events. The indicators are a limited estimate of the expected relative cumulative watershed sediment budget. The estimate is derived from a model that compiles watershed responses that might result from forest management related disturbances (roading, logging, and burning) over time and space. The percent change estimates are relative to the expected "natural" sediment and peak flows in watersheds with similar geomorphology, climate, and land use. The magnitude of those "natural" values are shown in Existing Conditions section of this chapter, and are used to characterize the undisturbed (by forest activities) watershed.

WATSED estimates a series of anticipated annual values over a period of years. In the tables depicting Watershed Characteristics, Condition Indicators, and Dominant Watershed Disturbances, the existing condition represents the estimate for 1998, which is prior to any anticipated disturbances related to the proposed activities. The tables depicting the "Projected watershed response" of proposed alternatives represent the WATSED estimates for the year 2006. The year 2006 was used because timber sale contracts are typically completed within five years, and modelled responses typically appear to be concentrated in a five to ten-year period following initiation of the project.

The relative change for both "natural" parameters is by definition none, or zero percent. In most watersheds within this project, the relative changes for both parameters are greater than zero, since the lands involved have been actively managed in the past, and since the responses are calculated by a deterministic model. For perspective, the magnitudes of the two percent change values for each alternative (as well as the existing conditions) reflects a level of stress on the watershed and stream system that has been induced over time. Some watersheds are more resilient to these stresses, and that must be considered in the synthesis of effects that follows. The sediment and peak flow estimates are only part of the information necessary to evaluate effects. In addition, the difference between alternatives with respect to these two estimated response values is relative to the magnitude of the different alternative actions. Rarely, in the region where this model was developed and is used, are differences in estimated sediment less than 10 to 20%, and peak flows less than 5% even detectable in any given watershed due to technical limitations in measurement and the natural variability of these parameters. It appears that most streams and water resource uses usually do not respond measurably to those magnitudes of change unless they are sustained for long periods.

The sediment and peak flow indicators reflect how watersheds with similar conditions and landtypes respond over time to a similar history of disturbance. The forest management activities used to calibrate the model included standard BMPs and Soil and Water Conservation Practices; therefore standard BMPs and Soil and Water Conservation Practices are necessary requirements for maintaining an effective confidence level in the model's use. Non-standard practices, management or natural disturbances not related to forest practices, and site-specific non-standard BMPs must be integrated into the final analysis of watershed response.

The modeled response variables are one basis for estimating effects of an alternative in this project. While associated road development and maintenance, logging, and prescribed burning are a source of one kind of disturbance, watershed restoration and mitigation are another. In order to demonstrate the potential effects of proposed restoration and mitigation actions in an alternative, four "net change" variables associated with the key restoration responses are used.

Models, such as WATSED, are designed to address and integrate a vast and complex number of conditions and organize the evaluation according to rule sets established by the author. In the case of WATSED, the rule sets were based on research, and data and analysis collected locally. The models, however, also include simplifying assumptions, and do not include all possible controlling factors. Therefore, the use of models is to provide one set of information to the technical user, who, along with a knowledge of the model and its limitations, other models, data, analyses, experience, and judgement must integrate all those sources to make the appropriate findings and conclusions.

Erosion and Sediment

The estimated annual sediment for a watershed or watershed area also was derived from methods documented in the R1/R4 Sediment Guides[4] and the Watbal Technical User Guide[5]; and calibrated for the Idaho Panhandle National Forest. The annual sediment load values are reported as tons per year per square mile of drainage area. The current sediment load modification is expressed as a percent of the "natural" sediment load and is based on the history of disturbances and climate patterns in the watershed, .

The road density is reported as the miles per square mile of watershed. Although road density itself does not characterize the likely condition of a watershed, it can serve as an indicator. Generally, road densities are high throughout northern Idaho and a trend toward lower road densities is desired for a variety of resource benefits (ICBEMP science assessment findings). It should be noted that watersheds with lower overall road densities in some cases are in a poorer condition as a result of individual road difficulties. Likewise, watersheds with greater road densities may continue to be in good condition. Therefore, additional road-related characteristics are also considered in this analysis.

Sensitive road density is a measure similar to road density, except that the roads considered are only those on sensitive landtypes. This measure and other road stratifications are able to better explain watershed responses than road density alone.

Channel Conflicts

Within the scope of this project, one of the primary disturbance factors to watershed response is related to roads that encroach on stream channels or floodplains. This encroachment often results in direct erosion, mass failure from undercut fills, opposite bank erosion, channel scour, loss of shade and channel stability elements; and it can inhibit the stream systems' ability to adjust to upstream disturbances and natural events. Miles of road that encroach within bankfull stage (normal flood stage) were inventoried within the geographic scope of the project and tracked through this analysis to provide a basis for value and benefit considerations. Riparian road density is estimated from maps, photos, and GIS to determine road segments within 300 feet of any perennial stream. This is presented in miles per square mile.

Stream Crossings

Watershed restoration within the scope of this project is essentially focused on certain aspects of road disturbances. The number of stream crossings and the risk of failure at inventoried stream crossings was inventoried and tracked. Risk of failure is a function of 1) the probability of failure of the crossing over an assumed design life (20 years); and 2) the cost of the failure to watershed and aquatic resources. Certainly, most failures are event based and do not occur incrementally over time. But, in order to provide a basis for comparison, the risk was calculated and reported as tons of sediment that could be delivered per year over the design life of the crossing. Stream crossing frequency is the number of road crossings divided by the number of miles of stream in a watershed. Finally, the number of inventoried road crossings which create fish migration barriers are listed.

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[4]*Cline, Cole, Megehan, Patten, and Potyondy, October 1981. Guide for Predicting Sediment Yields from Forested Watersheds, USDA Forest Service, Northern Region and Intermountain Region.*
[5]*Watershed Response Model for Forest Management: WATBAL Technical User Guide, Rick Patten, 1989, Clearwater National Forest.*

Overview of the Priest River Analysis Watershed

The Priest River watershed originates in the Canadian province of British Columbia and includes the State of Washington and the State of Idaho. The basin is oriented north-south and in fairly long and narrow. The watershed has four distinct segments: the Upper Priest River watershed, the Upper Priest Lake and Thoroughfare, the main Priest Lake and the Lower Priest River Basin.

The water quality in Priest Lake and in all of the Priest River watershed is a result of a complex web of inter-relationships between the terrestrial and aquatic ecosystems. The terrestrial ecosystem is quite varied because of the unique geologies underlying the basin, the historic range of glaciation and the natural range of precipitation. The vegetation of the basin developed because of the fire and moisture regimes. The timber types are a mosaic of fire dominated Ponderosa pine stands, mixed conifers and old growth cedar stands. Over the past 100 years, a considerable number of these timber stands have been accessed with logging roads and subsequently timber has been harvested.

The Upper Priest Watershed drains approximately 89,500 acres. The largest tributary to the Upper Priest River is the Hughes Fork. The two waterbodies coalesce just a little over a mile above the inlet to the Upper Priest Lake. Though road construction, mining and timber harvesting has occurred in these drainages, there are large blocks of land that have never been altered by man.

The Upper Priest Lake is an oligotrophic lake that is about 3 miles long and covers 1,340 acres. The largest single river feeding into the Upper Priest Lake is the Upper Priest River. Another smaller stream that flows into the east side of this small lake is Trapper Creek (12,300 acres). The shoreline of this small lake is not developed because it is under management by the USFS and the Idaho Department of Lands. Though there are no roads accessing the lake, thousands of tourists visit it each year. Most of the tourists arrive by boat, though trails access the shoreline. The body of water connecting the Upper Priest Lake to the main Priest Lake is named the Thoroughfare. The Thoroughfare is about 2.7 miles long and ranges from 75 to 100 feet wide and averages 4 feet deep. The Thoroughfare flows into the northern most tip of the main Priest Lake.

The geology, vegetative patterns and land use history is quite variable over the entire drainage. In the extreme north , the streams tend to have older, larger trees in the riparian zones and streams tend to be in balance between water sediment yields. Further south, there is a transition of stream characteristics. In this middle zone, the streams were recently glaciated, but the drainages have had more logging and roading than what occurred in the extreme northern section of the Priest Lake District. The streams in the middle drainages (i.e. Granite and Kalispell) tend to have elevated levels of bedload because of past land use practices and their inherently unstable soils.

The Priest Lake basin includes approximately 910 square miles (582,400 acres) and the lake covers about 23,300 acres. Priest Lake has very high water quality with a watershed dominated by federal and state managed lands. The Lake attracts hundreds of thousands of tourists annually to recreate. Shoreline residential development is considerable with over 1,000 mostly seasonal single family homes/cabins. While there are several sewer districts collecting and treating septic tank effluent, there are many individual septic drain fields. Public use and residential development is increasing as north Idaho is currently experiencing unprecedented growth and popularity. There is also considerable timber harvesting activity in the Priest Lake watershed.

Priest River is the outlet for Priest Lake. The drainage area for the Priest River, including Priest Lake, is approximately 981 square miles. (The Priest Lake Basin alone, includes 592 square miles). Below the dam, the lower Priest River drainage includes 360 square miles. The flow from the lake into the main Priest River is controlled by a low stage dam operated by Washington Water and Power. Major tributaries draining into the Priest River include Binarch Creek, Upper West Branch of the Priest River, Lower West Branch of the Priest River, East River, Quartz Creek. The geologies of the lower Priest River drainage are more weathered than what is found to the north because this portion of the Priest River basin did not experience

the ice flows of the last glaciation. The underlying geologies are a mix of weathered granitics and belts as well as lacustrine deposits. With the exception of those creeks flowing through belt rocks, most of the stream substrates are relatively fine. The land uses within the lower Priest River basin include home construction, timber harvesting, and agriculture. The Priest River flows into the Pend Oreille River at the town of Priest River. The mainstem of Priest River from the confluence with the Upper West Branch downstream to the Pend Oreille River is considered a Water Quality Limited Segment as identified by the EPA on the 303(d) list for the State of Idaho. The pollutant of concern in the Priest River is sediment.

Watson/Priest Lake Face Analysis Area

The shoreline of Priest Lake has a number of drainages that feed directly into the main lake. Most of the streams on the face of Priest Lake have been glaciated. The following table summarizes the existing condition of this area.

Table III-150. Watershed characteristics, condition indicators, and dominant watershed disturbances, Priest Lake Face Watershed.

Physical Characteristics	
HUC: 1701021513	
Drainage Area (square miles)	4.3
Sensitive Landtypes (percent of watershed)	25
Sensitive Snowpack (percent of watershed)	45
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Tango Creek; nutrients, sediment)
Apparent Watershed Status	Functioning at risk
Subwatersheds used for analysis	n/a
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	25
Current Runoff Modification (percent of peak)	4
Equivalent Clearcut Area (percent of watershed)	9
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	15.2
Current Sediment Load Modification (percent)	33
Road Density (miles/mile2)	4.4
Sensitive Road Density (miles/mile2)	0.9
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	3.1
Stream Crossings	
Number of Inventoried Crossings	5
Risk of Failure for Inventoried Crossings (tons/year)	229
Stream Crossing Frequency (#/mile of stream)	1.1
Number of Fish Migration Barriers	5

Granite Creek Watershed

Granite Creek is a major tributary to Priest Lake. The Granite Creek drainage is a fifth-order drainage that includes approximately 63,000 acres and 172 miles of stream. The primary beneficial use in the drainage is fisheries (e.g. bull trout), although in the lower reaches, there are domestic water rights associated with the private land holdings. The underlying geology of the basin is a mix of glaciated belts, glaciated granitics and glacial outwash.

The watershed has been strongly influenced by the continental glaciation, including a legacy of very sensitive landtypes. It also develops a snowpack in mid-winter that tends to be responsive to "rain-on-snow" hydrologic events. Granite Creek is not listed as a Water Quality Limited Stream. Most of the drainage appears to be properly functioning, but some tributaries are clearly at risk from the effects of land use and developments.

Granite Creek is a fairly stable stream (see surveys) that does have some problems with elevated sediment deposition and lack of incorporated large organic debris within the live stream channel. The lack of large organic debris is most likely linked to the presence of increased bedload movement and increased water yield within Granite Creek. Large organic debris that may have stored the sediment is not available. This lack of large organic debris may be attributed to an inability of the channel to incorporate such debris because of high streamflows and/or channel configurations. Stream channel stability has not been altered due to changes in the timing, magnitude, and quantity of flows from historical disturbance. Changes in flows generally exacerbate existing problems such as disturbed banks or encroaching roads.

The watershed has experienced several high energy floods in the last decade. These floods were regional in nature and are the expected response in this kind of landscape. The watershed was subject to an unusual degree of mass wasting and debris avalanches that resulted in local sedimentation and damage to some tributary streams. A disproportionate number of landslides appeared to be associated with roads in the watershed. Residential developments are evolving on private lands in the lower watershed.

Table III-151. Watershed characteristics, condition indicators, and dominant watershed disturbances, Granite Creek Watershed.

Physical Characteristics	
HUC: 1701021506	
Drainage Area (square miles)	99.2
Sensitive Landtypes (percent of watershed)	30
Sensitive Snowpack (percent of watershed)	63
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	67% Properly functioning 33% Functioning at risk
Subwatersheds used for analysis	Upper Granite Creek, South Fork Granite Creek, Sema Creek, South Facing Tributaries of lower Granite, Lower Main Granite Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	29
Current Runoff Modification (percent of peak)	6
Equivalent Clearcut Area (percent of watershed)	9
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	13.3
Current Sediment Load Modification (percent)	118
Road Density (miles/mile2)	3.7
Sensitive Road Density (miles/mile2)	0.8
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	3.1
Stream Crossings	
Number of Inventoried Crossings	3
Risk of Failure for Inventoried Crossings (tons/year)	13
Stream Crossing Frequency (#/mile of stream)	0.6
Number of Fish Migration Barriers	2

Table III-152. Watershed characteristics, condition indicators, and dominant watershed disturbances, Upper Granite Creek Watershed.

Physical Characteristics	
HUC: 170102150606	
Drainage Area (square miles)	30
Sensitive Landtypes (percent of watershed)	25
Sensitive Snowpack (percent of watershed)	48
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	68% Properly functioning 32% Functioning at risk
Subwatersheds used for analysis	Upper Granite Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	35
Current Runoff Modification (percent of peak)	2
Equivalent Clearcut Area (percent of watershed)	4
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	17.2
Current Sediment Load Modification (percent)	64
Road Density (miles/mile2)	2.7
Sensitive Road Density (miles/mile2)	0.5
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	3.2
Stream Crossings	
Number of Inventoried Crossings	0
Risk of Failure for Inventoried Crossings (tons/year)	0
Stream Crossing Frequency (#/mile of stream)	0.5
Number of Fish Migration Barriers	0

Table III-153. Watershed characteristics, condition indicators, and dominant watershed disturbances, South Fork Granite Creek and Sema Creek Watershed.

Physical Characteristics	
HUC: 170102150604	
Drainage Area (square miles)	34.6
Sensitive Landtypes (percent of watershed)	36
Sensitive Snowpack (percent of watershed)	74
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	Properly functioning
Subwatersheds used for analysis	South Fork Granite Creek, Sema Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	31
Current Runoff Modification (percent of peak)	6
Equivalent Clearcut Area (percent of watershed)	9
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	15
Current Sediment Load Modification (percent)	90
Road Density (miles/mile2)	2.3
Sensitive Road Density (miles/mile2)	0.5
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	1.7
Stream Crossings	
Number of Inventoried Crossings	0
Risk of Failure for Inventoried Crossings (tons/year)	0
Stream Crossing Frequency (#/mile of stream)	0.4
Number of Fish Migration Barriers	0

Table III-154. Watershed characteristics, condition indicators, and dominant watershed disturbances, South-facing Tributaries Along Lower Granite Creek.

Physical Characteristics	
HUC: 170102150600	
Drainage Area (square miles)	19.2
Sensitive Landtypes (percent of watershed)	25
Sensitive Snowpack (percent of watershed)	77
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	26% Properly functioning 75% Functioning at risk
Subwatersheds used for analysis	South-facing tributaries along Lower Granite Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	28
Current Runoff Modification (percent of peak)	5
Equivalent Clearcut Area (percent of watershed)	7
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	19.7
Current Sediment Load Modification (percent)	136
Road Density (miles/mile2)	5.7
Sensitive Road Density (miles/mile2)	1
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	4.8
Stream Crossings	
Number of Inventoried Crossings	3
Risk of Failure for Inventoried Crossings (tons/year)	13
Stream Crossing Frequency (#/mile of stream)	1.1
Number of Fish Migration Barriers	2

Table III-155. Watershed characteristics, condition indicators, and dominant watershed disturbances, Lower Main Granite Creek Watershed.

Physical Characteristics	
HUC: 170102150600	
Drainage Area (square miles)	15.9
Sensitive Landtypes (percent of watershed)	28
Sensitive Snowpack (percent of watershed)	52
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	Functioning at risk
Subwatersheds used for analysis	Lower Main Granite Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	24
Current Runoff Modification (percent of peak)	17
Equivalent Clearcut Area (percent of watershed)	22
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	16.9
Current Sediment Load Modification (percent)	264
Road Density (miles/mile2)	6.1
Sensitive Road Density (miles/mile2)	1.6
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	5.1
Stream Crossings	
Number of Inventoried Crossings	0
Risk of Failure for Inventoried Crossings (tons/year)	0
Stream Crossing Frequency (#/mile of stream)	0.8
Number of Fish Migration Barriers	0

Bismark Mountain Area of Kalispell Watershed

The Kalispell drainage encompasses about 25,000 acres with the mainstem of the channel measuring approximately 12.0 miles and is a major tributary to Priest Lake. Beneficial uses in this basin include fisheries, recreation and domestic water supplies. According to recent studies of Idaho's Department of Ecology (Phase 1 Diagnostic Analysis Priest Lake, Bonner County, Idaho, 1993-1995, Glen Rothrock and David Mosier, Idaho Department of Health and Welfare, Division of Environmental Quality, 1996), Kalispell contributes about three percent of the total volume to Priest Lake. In the DEQ study, it was determined that Kalispell Creek is contributing relatively high volumes of total phosphorous and Total inorganic nitrogen (TIN) as well as fine sediment to Priest Lake. One possible reason for the high TIN is that the lowland sections of this watershed have large areas of wetland. Vegetative decay and soil characteristics of the lowlands produce surface water and groundwater with high TIN, organic nitrogen, iron, and tea colored to reddish brown colored water from iron and organics.

The study also found that while Kalispell is only a moderate volume stream, it ranks third in the total suspended sediment (TSS) load delivered to Priest Lake. The report stated that further investigation is needed to determine whether the high level of TSS is natural or if it has been accelerated in the past 75 years because of recent fires and management activities. The DEQ monitored water yield from Kalispell basin in water years 1994 and 1995. The DEQ suggests that because Kalispell watershed has large lowlands of deep glacial outwash sediments, there is probably a recharging of the groundwater aquifers that occurs annually.

The major channel forming processes in the Kalispell Basin are associated with spring runoff, not with rain-on-snow events. Geologically, the watershed is quite complex. The northern half of the basin was modified by the last glaciation. The southern half of the basin is unglaciated. The underlying geology in the headwaters is a blend of granite and belt rocks. In the lower elevations, glacial outwash is most prevalent. In terms of soils, there is a wide range of soil types and associated stability. For the purpose of this analysis, attention will focus upon the sediment delivery potential of specific soils. A detailed report addressing soil stability are located in the project file.

The Bismark Mountain Area of Kalispell Creek is essentially defined by a small unnamed tributary in the lower Kalispell Creek watershed. There is no surface water connection between the tributary and Kalispell Creek; however, streamflows from the unnamed tributary probably enter Kalispell Creek via subsurface connections. Kalispell Creek (within Idaho) is listed as a Water Quality Limited Stream segment due to sediment; the tributary within the Bismark Mountain Area is not listed.

Table III-156. Watershed characteristics, condition indicators, and dominant watershed disturbances, Bismark Mountain Area of the Kalispell Creek Watershed.

Physical Characteristics	
HUC: 170102150505	
Drainage Area (square miles)	9.2
Sensitive Landtypes (percent of watershed)	19
Sensitive Snowpack (percent of watershed)	45
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Kalispell Creek; sediment)
Apparent Watershed Status	Not properly functioning
Subwatersheds used for analysis	n/a
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	24
Current Runoff Modification (percent of peak)	4
Equivalent Clearcut Area (percent of watershed)	4
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	15.2
Current Sediment Load Modification (percent)	175
Road Density (miles/mile2)	6.2
Sensitive Road Density (miles/mile2)	1.2
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	6.4
Stream Crossings	
Number of Inventoried Crossings	0
Risk of Failure for Inventoried Crossings (tons/year)	0
Stream Crossing Frequency (#/mile of stream)	1.2
Number of Fish Migration Barriers	0

Lamb Creek Watershed

The Lamb Creek drainage encompasses approximately 13,345 acres and discharges directly into the "outlet" for Priest Lake. Lamb Creek has been identified in the IPNF Forest Plan as an "unscheduled" drainage and it has been identified by the EPA and the DEQ as a Water Quality Limited Segment. The reasoning for the listing was the high sediment load moving through the Lamb Creek channel. Lamb Creek was surveyed by the DEQ between 1994 and 1995 to determine if Lamb Creek supported beneficial uses. Beneficial uses within Lamb Creek include recreation, agriculture, domestic water supplies and fisheries. According to a report from DEQ dated 12/30/96, the lower reaches of Lamb Creek are fully supporting beneficial uses, whereas the higher elevation reaches need further verification.

Lamb Creek is an unusual watershed system that flows into Priest River just below the lake. It has been extensively developed both on and off national forest system lands. In the lower end of the watershed, there has been considerable modifications of a historic wetland complex because of generally non-forest management activities such as draining, grazing and home development. Runoff patterns within the Lamb Creek drainage have been altered due to past disturbances. Tree removal from past harvest has increased water yield due to reduction of evapotranspiration. The timing and magnitude of peak flows have been altered due to changes in canopy cover which increase susceptibility to rain-on-snow events and due to the extension of channel networks from road construction. Overall, water yield is decreasing as older harvest units revegetate.

Home development is encroaching on the lower reaches of Lamb Creek. Flooding has been reported as a problem in recent years. Current increases in peak flows due to past disturbance are relatively low. The location of roads and structures within the historic floodplain of the stream and wetlands contribute to flood occurrence and damages.

The streams in the headwaters are transporting elevated amounts of sediment and show indications of channel scouring from high water yields. Downstream, where the gradient of Lamb Creek is less, surveys show that the stream is depositing a considerable amount of sand within the channel confines. The increase is sediment deposition is coupled with an increase in cattle grazing. Years ago, Lamb Creek was ditched through the existing agricultural lands. This work was done to improve the land for farming. Unfortunately, by ditching the mainstem of Lamb Creek, the energy of the stream increased and spring runoff to the lowlands was accelerated. Prior to ditching the agricultural lands, it is likely that Lamb Creek fed a very large contiguous wetland that slowly released the water into the outlet of Priest Lake. In the lowest elevations of Lamb Creek, a recent boom in home development along the creek is causing more stream damage. Some private land owners have encroached onto the floodplain and removed critical riparian vegetation. The result has been destabilized channel banks and increased flooding. In summary, Lamb Creek is hydrologically destabilized. Over time, the headwaters of the drainage will stabilize. However, the middle and lower reaches of Lamb Creek will not stabilize without a cooperative effort among property owners of the basin. Based on several years of field reviews by Forest Service personnel, it appears that while Lamb Creek may support beneficial uses, there are some hydrologic processes that are out of equilibrium within the basin (i.e. pool filling, widening of the channels). See the project files for a complete field review of the Lamb Creek drainage.

Table III-157. Watershed characteristics, condition indicators, and dominant watershed disturbances, Lamb Creek Watershed.

Physical Characteristics	
HUC: 170102150407	
Drainage Area (square miles)	30.1
Sensitive Landtypes (percent of watershed)	17
Sensitive Snowpack (percent of watershed)	37
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Lamb Creek; sediment)
Apparent Watershed Status	60% Functioning at risk 40% Not properly functioning
Subwatersheds used for analysis	Lamb Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	23
Current Runoff Modification (percent of peak)	10
Equivalent Clearcut Area (percent of watershed)	12
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	12.6
Current Sediment Load Modification (percent)	230
Road Density (miles/mile2)	7.2
Sensitive Road Density (miles/mile2)	1
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	6.8
Stream Crossings	
Number of Inventoried Crossings	12
Risk of Failure for Inventoried Crossings (tons/year)	49
Stream Crossing Frequency (#/mile of stream)	1.2
Number of Fish Migration Barriers	0

Binarch Creek Watershed

Binarch Creek is listed in the IPNF Forests Plan as an unscheduled drainage and is listed as a Water Quality Limited Segment (WQLS) by the United States Environmental Protection Agency (EPA) and the Idaho Department of Environmental Quality (DEQ) the Appendix C of the 1994 303(D) list for the State of Idaho, Oct. 7, 1994, EPA, Region 10. The pollutant of concern in the Binarch drainage is sediment. Binarch Creek is an intermediate sized drainage that is functioning at risk.

The underlying geology of the Binarch drainage is granite in the headwaters and belt rocks in the remainder of the drainage. This watershed was not scoured by glaciation, but its valley is filled with reworked glacial outwash pushed in from the melting glaciers immediately to the north. This has resulted in stream channel that may not reflect residual slopes. Binarch Creek flows subsurface in the lower to mid-elevations except during the periods of heavy annual spring runoff. According to the 1998 field reviews of the stream, there are some reaches that are quite stable while others show elevated levels of sand deposition. The elevated sand deposition is attributed to past road construction, and failed beaver dams. The survey found that the stream appears to move bedload derived primarily from the channel, not from the slopes. Within the Binarch Creek drainage, beaver dams play a vital role in controlling/maintaining streamflows and sediment transport. Historically, the mainstem of Binarch Creek was a series of beaver dams and ponds. However, the beaver population was largely trapped out. Some of the older dams have failed and few dams have replaced them. Subsequently, large volumes of sediment began moving through the lower reaches of Binarch Creek and the streamflows were reduced. In the past 10 to 15 years, it appears that the beaver populations are recovering. With the increase in the beaver population in Binarch Creek, an expected improvement in the overall condition of the stream should occur over time. The stream would continue to trend towards stability. The key beneficial use in this drainage is fisheries. There are no domestic water sources within this drainage.

Table III-158. Watershed characteristics, condition indicators, and dominant watershed disturbances, Binarch Creek Watershed.

Physical Characteristics	
HUC: 170102150405	
Drainage Area (square miles)	10.7
Sensitive Landtypes (percent of watershed)	34
Sensitive Snowpack (percent of watershed)	74
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Binarch Creek; sediment)
Apparent Watershed Status	Functioning at risk
Subwatersheds used for analysis	Binarch Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	25
Current Runoff Modification (percent of peak)	15
Equivalent Clearcut Area (percent of watershed)	18
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	15.2
Current Sediment Load Modification (percent)	108
Road Density (miles/mile2)	6.4
Sensitive Road Density (miles/mile2)	2.2
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	5.7
Stream Crossings	
Number of Inventoried Crossings	5
Risk of Failure for Inventoried Crossings (tons/year)	13
Stream Crossing Frequency (#/mile of stream)	0.6
Number of Fish Migration Barriers	0

Upper West Branch Priest River Watershed

The Upper West Branch of the Priest River drainage ranges from 6173 feet at the top of North Baldy to about 2,320 feet where the Upper West Branch flows into the Priest River. The river begins in the State of Washington and flows southeast into the State of Idaho. The drainage has complex ownership and land use patterns and most the drainage appears to be not properly functioning. The basin is not properly functioning because of an array of intensive land use practices scattered throughout the basin. The basin was field reviewed in 1998 and all reports in the project file.

Although its uplands were essentially untouched by continental glaciation, much of its main channel and lower riparian area was inundated by glacial and fluvial outwash from melting glaciers higher in the Priest River basin. The majority of the watershed is underlain by granite, belt rocks or lacustrine deposits and overall the watershed is relatively stable. Within the drainage, there is a component of highly weathered granitic soils which exhibit surface erosion problems. The fluvial outwash bottomlands are sensitive to land uses, have a flooding potential, and often have high-delivery efficiencies. Development of snowpacks that are very sensitive to "rain-on-snow" climatic events occur frequently throughout the basin in most winters.

The current condition of the of the Upper West Branch is a result of both the historical fires as well as logging, grazing and roading. Early in this century, wildfires in the headwaters of the Upper West Branch caused water yields to increase to the point where the natural channel size could not handle them. Recurrent flooding damaged stream banks, and widened streams. As the width to depth ratios increased, many of the

riparian trees toppled. These trees would have started the long process of stabilizing the stream channel by creating log step-downs, which in turn would trap bedload sediments, forming channel bars. These bars would eventually re-vegetate and become the new channel banks, decreasing width/depth ratios. However, many of the trees that fell at this time were removed in salvage operations after the fires (evidenced by the number of sawed stumps in the stream channel). In addition to wildfires and streamside salvaging, the roading and logging that occurred throughout the basin altered the natural water yield and vegetative patterns. The combination of the previous mentioned disturbances have caused the channels within the Upper West Branch drainage to change considerably from what they were 100 years ago. The local geology is highly decomposed granitics, therefore the channel bottom will always have a high sand component. However, the presence of mid-channel bars throughout the basins are indications of accelerated sedimentation above what would have been expected. A detailed report of the channel conditions is located in the project files.

The Upper West Branch is not listed as a Water Quality Limited Stream. Its parent stream, Priest River, is listed from the Upper West Branch to its confluence with the Pend Oreille River, due to sediment. There would be no increase in sediment to Priest River under any alternative. Beneficial uses within the Upper West Basin include domestic water sources, recreation, agriculture and fisheries.

Table III-159. Watershed characteristics, condition indicators, and dominant watershed disturbances, Upper West Branch of Priest River Watershed.

Physical Characteristics	
HUC: 1701021503	
Drainage Area (square miles)	70.9
Sensitive Landtypes (percent of watershed)	22
Sensitive Snowpack (percent of watershed)	50
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	16% Properly functioning, 18% Functioning at risk, 66% Not properly functioning
Subwatersheds used for analysis	Upper West Branch, Solo Creek, Galena Creek, Goose Creek, Main Upper West Branch
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	25
Current Runoff Modification (percent of peak)	7
Equivalent Clearcut Area (percent of watershed)	9
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	10.7
Current Sediment Load Modification (percent)	191
Road Density (miles/mile2)	6.1
Sensitive Road Density (miles/mile2)	1.3
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	4.1
Riparian Road Density (miles/mile2)	5.5
Stream Crossings	
Number of Inventoried Crossings	205
Risk of Failure for Inventoried Crossings (tons/year)	181
Stream Crossing Frequency (#/mile of stream)	1
Number of Fish Migration Barriers	0

Upper West Branch Headwaters

Runoff patterns and sediment yields within the headwaters of the Upper West Branch drainage have been altered somewhat due to past disturbances. The frequency and magnitudes of frequently occurring peak flows has likely been increased in the past due mainly to reductions of evapotranspiration, changes in canopy cover that decrease interception losses and increase susceptibility of sites to rain-on-snow events, and the extension of channel networks from road construction. The trend in water yield is decreasing within the drainage as the vegetation becomes re-established. Stream channel condition and stability have been altered due to changes in the timing, magnitude, and quantity of flows from historical disturbance. Changes in flows have generally exacerbated existing channel disturbances such as weakened stream banks or encroaching roads within channels or their active floodplain.

Table III-160. Watershed characteristics, condition indicators, and dominant watershed disturbances, Upper West Branch Headwaters Watershed.

Physical Characteristics	
HUC: 170102150305	
Drainage Area (square miles)	23.3
Sensitive Landtypes (percent of watershed)	16
Sensitive Snowpack (percent of watershed)	61
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	49% Properly functioning, 12% Functioning at risk, 39% Not properly functioning
Subwatersheds used for analysis	Upper West Branch
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	27
Current Runoff Modification (percent of peak)	7
Equivalent Clearcut Area (percent of watershed)	9
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	12.9
Current Sediment Load Modification (percent)	179
Road Density (miles/mile2)	4.5
Sensitive Road Density (miles/mile2)	0.6
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	1.1
Riparian Road Density (miles/mile2)	3.1
Stream Crossings	
Number of Inventoried Crossings	2
Risk of Failure for Inventoried Crossings (tons/year)	3
Stream Crossing Frequency (#/mile of stream)	0.5
Number of Fish Migration Barriers	0

Solo and Galena Creek Watershed

Table III-161. Watershed characteristics, condition indicators, and dominant watershed disturbances, Solo and Galena Creek Watershed.

Physical Characteristics	
HUC: 170102150305	
Drainage Area (square miles)	8.3
Sensitive Landtypes (percent of watershed)	12
Sensitive Snowpack (percent of watershed)	72
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	Not properly functioning
Subwatersheds used for analysis	Solo Creek, Galena Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	31
Current Runoff Modification (percent of peak)	14
Equivalent Clearcut Area (percent of watershed)	20
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	13.7
Current Sediment Load Modification (percent)	232
Road Density (miles/mile2)	7.2
Sensitive Road Density (miles/mile2)	0.6
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0.1
Riparian Road Density (miles/mile2)	4.9
Stream Crossings	
Number of Inventoried Crossings	81
Risk of Failure for Inventoried Crossings (tons/year)	92
Stream Crossing Frequency (#/mile of stream)	1.7
Number of Fish Migration Barriers	2

Goose Creek

The Goose Creek drainage has been severely modified in the last hundred years through ditching efforts in the lower reaches of the watershed. Prior to settlement, the lower end of the Goose Creek drainage was most likely a large contiguous wetland that gradually released water to the Upper West Branch. Today the mainstem of Goose Creek is largely a ditch where it flows across private lands: no longer is the stream able to use its floodplain to deposit sediment or attenuate peak streamflows. Upstream of the private lands, the mainstem of Goose Creek is not ditched, but the creek has excessive bedload. Much of the bedload has been generated by past road construction adjacent to the creeks and by stream crossings. Intensive land-use practices within the Goose Creek drainage includes timber harvesting, road construction, home construction and cattle grazing.

Table III-162. Watershed characteristics, condition indicators, and dominant watershed disturbances, Goose Creek Watershed.

Physical Characteristics	
HUC: 170102150303	
Drainage Area (square miles)	21.9
Sensitive Landtypes (percent of watershed)	25
Sensitive Snowpack (percent of watershed)	50
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	45% Functioning at risk 55% Not properly functioning
Subwatersheds used for analysis	Goose Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	27
Current Runoff Modification (percent of peak)	8
Equivalent Clearcut Area (percent of watershed)	11
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	12
Current Sediment Load Modification (percent)	290
Road Density (miles/mile2)	6.8
Sensitive Road Density (miles/mile2)	1.5
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	2.7
Riparian Road Density (miles/mile2)	6.4
Stream Crossings	
Number of Inventoried Crossings	102
Risk of Failure for Inventoried Crossings (tons/year)	70
Stream Crossing Frequency (#/mile of stream)	1.2
Number of Fish Migration Barriers	0

Mainstem of Upper West Branch

The mainstem of the Upper West Branch drainage is where so much of the historical sediment from past activities upstream has settled. In addition to sediment delivered from upstream sources, sediment has also been contributed to this section of stream from the localized activities. There is no current trend towards recovery of in-stream sediment yet in this portion of the Upper West Branch drainage.

Table III-163. Watershed characteristics, condition indicators, and dominant watershed disturbances, Main Upper West Branch Watershed.

Physical Characteristics	
HUC: 170102150300	
Drainage Area (square miles)	17.5
Sensitive Landtypes (percent of watershed)	31
Sensitive Snowpack (percent of watershed)	27
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	Not properly functioning
Subwatersheds used for analysis	Main Upper West Branch
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	24
Current Runoff Modification (percent of peak)	16
Equivalent Clearcut Area (percent of watershed)	20
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	13.9
Current Sediment Load Modification (percent)	216
Road Density (miles/mile2)	9.2
Sensitive Road Density (miles/mile2)	2.2
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0.2
Riparian Road Density (miles/mile2)	7.1
Stream Crossings	
Number of Inventoried Crossings	20
Risk of Failure for Inventoried Crossings (tons/year)	16
Stream Crossing Frequency (#/mile of stream)	1.3
Number of Fish Migration Barriers	0

Lower West Branch Priest River Watershed

In the fall of 1998, the mainstem of the Lower West Branch of the Priest River and several of the major drainages were field investigated. The purpose of the field review was to document existing conditions and to identify opportunities for improvements. A compilation of the field reviews is located in the project file. The Lower West Branch includes approximately 55,000 acres. Elevations within the Lower West Branch drainage range from 5,988 feet on South Baldy Mountain to 2,100 feet at the confluence of the Lower West Branch and the mainstem of the Priest River. The watershed is underlain by granite, belt rocks and ancient lake deposits. A large portion of the lower reaches and watershed of Lower West Branch are made up of broad, relatively flat, alluvium and residual lake deposits that have evolved into vast meadow areas. These areas and the streams they support are sensitive to disturbances from the upstream watershed and especially from the local developments.

Activities throughout the basin include logging, ranching and homesteading. Within the entire Lower West Branch, logging has occurred on over 25% of the drainage and the road density throughout the basin is about 5.7 mile/mile squared. The headwaters of the basin are managed primarily by the US Forest Service though there are some inholdings of private land. A relatively large portion of the lowlands within the Lower West Branch are privately owned and managed. The mainstem of the Lower West Branch has been adversely impacted by frequent introductions of large volumes of bedload, historic ditching of channels, past filling of wetlands and the altering of natural drainage patterns with road construction. The channel will not likely move towards stability until large scale rehabilitation projects are implemented. Beneficial uses within the basin include domestic water supplies, fisheries, recreation and agriculture. The mainstem of the Lower West Branch was identified by the EPA as a Water Quality Limited Segment for sediment.

The Lower West Branch of Priest River is a large and complex watershed system with a long history of extensive development and land uses. With the exception of some tributaries, the watershed and its streams appear to range from poorly functioning to functioning at risk. Analyses and field reconnaissance indicates that excessive sediment loading is and has been chronic in the watershed for a long period of time. There is evidence that peak flows have been elevated somewhat in parts of the watershed. There appears to be a notable improvement trend underway for both hydrologic characteristics

Table III-164. Watershed characteristics, condition indicators, and dominant watershed disturbances, Lower West Branch of Priest River Watershed.

Physical Characteristics	
HUC: 1701021502	
Drainage Area (square miles)	85.8
Sensitive Landtypes (percent of watershed)	30
Sensitive Snowpack (percent of watershed)	30
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Lower West Branch of Priest River; sediment)
Apparent Watershed Status	36% Functioning at risk 65% Not properly functioning
Subwatersheds used for analysis	Lower West Branch Headwaters, North Facing Lower West Branch, Moores Creek, South-facing Lower West Branch, Main Valley Lower West Branch
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	23
Current Runoff Modification (percent of peak)	6
Equivalent Clearcut Area (percent of watershed)	6
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	10.9
Current Sediment Load Modification (percent)	296
Road Density (miles/mile2)	5.7
Sensitive Road Density (miles/mile2)	1.1
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0.4
Riparian Road Density (miles/mile2)	4.3
Stream Crossings	
Number of Inventoried Crossings	181
Risk of Failure for Inventoried Crossings (tons/year)	207
Stream Crossing Frequency (#/mile of stream)	1.1
Number of Fish Migration Barriers	3

Lower West Branch Headwaters

The Lower West Branch headwaters have had a long history of intense forest development and cattle grazing, and has responded with elevated sediment delivery and peak flows. Those characteristics are exhibiting a slow recovery trend as roads stabilize and vegetation becomes re-established.

Table III-165. Watershed characteristics, condition indicators, and dominant watershed disturbances, Lower West Branch Headwaters.

Physical Characteristics	
HUC: 170102150211 and 13	
Drainage Area (square miles)	28.2
Sensitive Landtypes (percent of watershed)	23
Sensitive Snowpack (percent of watershed)	47
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Lower West Branch of Priest River; sediment)
Apparent Watershed Status	37% Functioning at risk 63% Not properly functioning
Subwatersheds used for analysis	Lower West Branch Headwaters
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	26
Current Runoff Modification (percent of peak)	11
Equivalent Clearcut Area (percent of watershed)	15
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	12.4
Current Sediment Load Modification (percent)	282
Road Density (miles/mile2)	6.8
Sensitive Road Density (miles/mile2)	1.1
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0.2
Riparian Road Density (miles/mile2)	4.2
Stream Crossings	
Number of Inventoried Crossings	95
Risk of Failure for Inventoried Crossings (tons/year)	95
Stream Crossing Frequency (#/mile of stream)	0.9
Number of Fish Migration Barriers	0

North Facing Tributaries of the Lower West Branch

Many of the streams in this area have suffered from extensive sediment sources, primarily related to forest practices of the past. The sediment loads still appear to be excessive, but a slow recovery is underway.

Table III-166. Watershed characteristics, condition indicators, and dominant watershed disturbances, North-facing Lower West Branch Tributaries.

Physical Characteristics	
HUC: 170102150202 and 04	
Drainage Area (square miles)	19.5
Sensitive Landtypes (percent of watershed)	37
Sensitive Snowpack (percent of watershed)	38
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Lower West Branch of Priest River; sediment)
Apparent Watershed Status	36% Functioning at risk 64% Not properly functioning
Subwatersheds used for analysis	Lower West Branch Tributaries
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	24
Current Runoff Modification (percent of peak)	5
Equivalent Clearcut Area (percent of watershed)	6
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	14.2
Current Sediment Load Modification (percent)	261
Road Density (miles/mile2)	4.8
Sensitive Road Density (miles/mile2)	1
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	3.8
Stream Crossings	
Number of Inventoried Crossings	24
Risk of Failure for Inventoried Crossings (tons/year)	49
Stream Crossing Frequency (#/mile of stream)	1.2
Number of Fish Migration Barriers	0

Moores Creek

Moores Creek has been extensively developed and modified by both forest practices and other land uses. Sediment yields in the basin are profound. Peak flows have likely been substantially increased, although there are no apparent in-stream responses. The streams have become wider and shallower, and in trying to adjust to the sustained loading, the streams are weakening and eroding their banks. Livestock use has compounded this effect in the lower reaches, particularly from riparian trampling and breaking down of stream banks.

Table III-167. Watershed characteristics, condition indicators, and dominant watershed disturbances, Moores Creek Watershed.

Physical Characteristics	
HUC: 170102150215	
Drainage Area (square miles)	17.1
Sensitive Landtypes (percent of watershed)	24
Sensitive Snowpack (percent of watershed)	12
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Lower West Branch of Priest River; sediment)
Apparent Watershed Status	38% Functioning 62% Not properly functioning
Subwatersheds used for analysis	Moores Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	23
Current Runoff Modification (percent of peak)	13
Equivalent Clearcut Area (percent of watershed)	15
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	13.8
Current Sediment Load Modification (percent)	404
Road Density (miles/mile2)	8.2
Sensitive Road Density (miles/mile2)	1.3
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	5.4
Stream Crossings	
Number of Inventoried Crossings	31
Risk of Failure for Inventoried Crossings (tons/year)	15
Stream Crossing Frequency (#/mile of stream)	1.2
Number of Fish Migration Barriers	0

South Facing Lower West Branch Tributaries

Table III-168. Watershed characteristics, condition indicators, and dominant watershed disturbances, South-facing Lower West Branch Tributaries.

Physical Characteristics	
HUC: 170102150200	
Drainage Area (square miles)	5.3
Sensitive Landtypes (percent of watershed)	39
Sensitive Snowpack (percent of watershed)	26
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Lower West Branch of Priest River; sediment)
Apparent Watershed Status	92% Functioning at risk 8% Not properly functioning
Subwatersheds used for analysis	South-facing Lower West Branch Tributaries
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	24
Current Runoff Modification (percent of peak)	5
Equivalent Clearcut Area (percent of watershed)	6
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	18.9
Current Sediment Load Modification (percent)	114
Road Density (miles/mile2)	4.9
Sensitive Road Density (miles/mile2)	1.4
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	4.1
Stream Crossings	
Number of Inventoried Crossings	15
Risk of Failure for Inventoried Crossings (tons/year)	35
Stream Crossing Frequency (#/mile of stream)	0.7
Number of Fish Migration Barriers	1

Main Valley Lower West Branch Watershed

Table III-169. Watershed characteristics, condition indicators, and dominant watershed disturbances, Main Valley Lower West Branch Watershed.

Physical Characteristics	
HUC: 170102150200	
Drainage Area (square miles)	16.3
Sensitive Landtypes (percent of watershed)	35
Sensitive Snowpack (percent of watershed)	13
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Lower West Branch of Priest River; sediment)
Apparent Watershed Status	11% Functioning at risk 89% Not properly functioning
Subwatersheds used for analysis	Main Valley Lower West Branch
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	23
Current Runoff Modification (percent of peak)	8
Equivalent Clearcut Area (percent of watershed)	10
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	14.3
Current Sediment Load Modification (percent)	249
Road Density (miles/mile2)	5.6
Sensitive Road Density (miles/mile2)	1.0
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0.2
Riparian Road Density (miles/mile2)	3.6
Stream Crossings	
Number of Inventoried Crossings	16
Risk of Failure for Inventoried Crossings (tons/year)	13
Stream Crossing Frequency (#/mile of stream)	0.9
Number of Fish Migration Barriers	2

Quartz Watershed

A watershed survey was conducted in the Quartz Creek drainage in the fall of 1998. Complete field notes are available in the project file. Elevations within the Quartz watershed vary from 4091 feet on the peak of Quartz Mountain to around 2190 near the confluence of Quartz Creek and the Priest River. The drainage area encompasses approximately 7300 acres including 1327 acres of private lands. Generally speaking, the headwaters of Quartz Creek are composed of well weathered granites and belts, whereas the lowlands are primarily old lake deposits.

The primary contributors of bedload to the tributaries and mainstem of Quartz Creek are the roads. Many of the roads are located immediately adjacent to the streams and/or the roads are native surfaces and are prone to erosion. See the project files for complete stream condition descriptions. Beneficial uses within the Quartz Creek drainage include fisheries, recreation, agriculture and domestic water supplies.

Table III-170. Watershed characteristics, condition indicators, and dominant watershed disturbances, Quartz Creek Watershed.

Physical Characteristics	
HUC: 170102150105	
Drainage Area (square miles)	11.4
Sensitive Landtypes (percent of watershed)	41
Sensitive Snowpack (percent of watershed)	31
Qualifications	
Is all or part listed as Water Quality Limited?	No
Apparent Watershed Status	Functioning at risk
Subwatersheds used for analysis	Quartz Creek
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	24
Current Runoff Modification (percent of peak)	7
Equivalent Clearcut Area (percent of watershed)	8
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	14.9
Current Sediment Load Modification (percent)	281
Road Density (miles/mile2)	5.7
Sensitive Road Density (miles/mile2)	1.8
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0.4
Riparian Road Density (miles/mile2)	5.2
Stream Crossings	
Number of Inventoried Crossings	4
Risk of Failure for Inventoried Crossings (tons/year)	19
Stream Crossing Frequency (#/mile of stream)	1.3
Number of Fish Migration Barriers	0

Priest River Face Watersheds

There are a number of small unnamed drainages that flow into the Priest River. Generally speaking these streams have been heavily harvested as part of the early logging in the Priest River Basin.

Table III-171. Watershed characteristics, condition indicators, and dominant watershed disturbances, Priest River Face Area.

Physical Characteristics	
HUC: 1701021501	
Drainage Area (square miles)	17.8
Sensitive Landtypes (percent of watershed)	30
Sensitive Snowpack (percent of watershed)	9
Qualifications	
Is all or part listed as Water Quality Limited?	Yes (Priest River; sediment)
Apparent Watershed Status	78% Functioning at risk 22% Not properly functioning
Subwatersheds used for analysis	n/a
Hydrologic Regime	
Estimated Peak Flow (Q2 cfsm)	23
Current Runoff Modification (percent of peak)	10
Equivalent Clearcut Area (percent of watershed)	10
Erosion and Sediment	
Estimated Annual Sediment (tons/mile2/year)	12.3
Current Sediment Load Modification (percent)	194
Road Density (miles/mile2)	6.1
Sensitive Road Density (miles/mile2)	0.4
Channel Conflicts	
Road Encroaching at Bankfull Stage (miles)	0
Riparian Road Density (miles/mile2)	0.2
Stream Crossings	
Number of Inventoried Crossings	2
Risk of Failure for Inventoried Crossings (tons/year)	1
Stream Crossing Frequency (#/mile of stream)	0.5
Number of Fish Migration Barriers	0

ENVIRONMENTAL CONSEQUENCES

Introduction

As stated earlier in the Affected Environment portion of this section, each of the project areas assessed were analyzed on at least two scales: the local site or tributaries where activities occur and the cumulative effect watershed. The cumulative effect watershed (or watershed area) is the logical culmination point of water flow where the effects of the distributed project activities could possibly integrate or synchronize over time and space and be addressed cumulatively in a larger watershed.

Effects Common to Alternatives

There are several common, or typical effects, that would occur with any action alternative and are discussed below. Many of these effects are related to the watershed restoration activities such as removal of encroaching roads. In the discussion, the effects of not removing the encroaching road (or other action) also is discussed.

Effects of Removal of Encroaching Roads

Effect on stream condition: Encroaching roads occupy the active flood prone area associated with the stream, or the active channel itself with road fill. Those road sections reduce capacity of the stream at flood stages, alter flow patterns, increase local velocities, redistribute sediment loads, and compromise the function of the stream's riparian areas. During flood flows, the depth of flow is increased, and normal flow patterns are disrupted. This often causes scouring of opposing stream banks and undercuts opposing hillslopes, which in turn is an erosion source that increases sediment input into the stream. Sometimes the scour undercuts the opposing slope which destabilizes it and initiates a mass failure (such as a slump or debris avalanche) of material into the stream. In some cases, the road constricts the channel enough that the natural meanders are straightened and stream slope is steepened. This can result in rapid adjustments by the stream to regain its balance with the water flow and sediment load. The result is an unstable stream which will compromise the support of beneficial uses.

Effect on sediment: Roads located close to streams usually deliver more sediment to streams than other roads for two reasons: 1) roads in close proximity to streams are more likely to be subject to the erosive forces of running water; and 2) eroded materials do not have to travel far to be delivered to the streams. The closer a road is to the stream, the smaller the expanse of forest floor and its rough materials available to capture and store sediment.

Road surface treatments, such as application of gravel would reduce sediment delivered to streams by reducing the amount of sediment eroded from the road surface.

Removal of encroaching roads would reduce sediment delivery in the short and long-term. Improvement in stream condition and habitat in terms of clarity, accumulation of sediment, loss of cover, erosive velocities, etc., would occur at the road removal site and immediately downstream.

During and after road removal, some fine sediment would likely be delivered to the water. The majority of sediment delivered to the stream would be in the form of suspended sediment. The suspended sediment would route through the stream system quickly and the primary effect would be turbidity (loss of clarity of the water). The increase in turbidity would be measurable for a short time immediately following disturbance and would be evident for short distances downstream from the fill removed (generally less than 1,000 feet). The amount of sediment from road fill removal would be low, especially when compared to the long-term reduction that would result. Standard Best Management Practices (including silt fences, mulch, and coffer structures to de-water the work site) as well as other erosion control techniques would minimize

the amount of sediment delivered in the short-term. The re-establishment of effective vegetation would essentially eliminate long-term sediment inputs.

Tree Mortality and its Effect on Stream Temperature

At the tributary scale, stream temperature would not be expected to change in most watersheds under any alternative including the No-Action Alternative. No harvest would occur where shade or cover to the stream would be affected under any action alternative. Some trees that are currently providing shade to streams have already died or may die soon as a result of the Douglas-fir beetle attack. The loss of shade from this mortality would not be expected to increase water temperatures locally or downstream due to one or more of the following: high mixing capacity of most mountain streams, inflow of subsurface water, and/or the low amount mortality of shade trees in riparian areas.

Effects of Stream Crossing Failures on Abandoned or Unmaintained Roads

Extensive road networks were constructed in the 1960's throughout the analysis area. Typically these older roads were designed for a useful life of 20 years, including the crossing structures. The majority of these roads presently are stabilized with vegetation, and are not actively delivering sediment to stream channels. Although often brushed in, many of these roads still have culverts and fills at stream crossings. Abandoned and unmaintained roads, including stream crossings, can be expected to fail over time. These failures are usually associated with relatively infrequent hydrologic and climatic events. A typical example is when warm, moisture-laden air masses move into the region over a watershed that is dominated by a ripe snowpack (near freezing temperature and loaded with water), that is ready to melt. The results are often a rapid and flashy runoff that is referred to as a "rain-on-snow" flood. During these events, water flow can exceed the capacity of the crossing structure (such as a culvert pipe or bridge), or debris blocks the inlet. The water rises and overtops the fill, eroding it (often en masse), and depositing the material into the creek. In some locations, pore water pressure in the soil actually destabilizes the fill material and the hillslope, causing them to slump into the creek.

Effects of Sediment from Temporary Road Construction

Temporary roads are equivalent to system roads in that they are designed and planned as part of the transportation network. The difference between temporary and system roads is that a temporary road is intended to be restored to a hydrologically inert state after use. Slope stability would be restored, surface erosion would be eliminated, and all crossings and associated fill would be removed from the channel and floodplain and stabilized. The site should need no future maintenance after this restoration. The restoration of the site of a temporary road would be the responsibility of the timber sale purchaser before the end of the timber sale contract. Some timber sale contracts would last approximately five years.

Temporary roads would cause the same risk to water resources as any other road when they are in place. There would be some additional risk with temporary roads in that they are not designed to the same specifications as a system road. Locations, however, would either be specified or agreed upon between the timber sale purchaser and the timber sale administrator or engineer.

Effects of Stream Crossings

__Stream crossing or pipe upgrades:__ Risk of stream crossings and culverts is a function of the chance of failure and the cost (or damage) associated with that failure. The design of the structure and the frequency of flood events determine the chance of failure. The cost of failure represents the amount of sediment eroded from the fill and delivered to the stream and the resulting response. The stream response can vary from turbidity, to deposition of sediment and loss of quality habitat, to entrainment of channel material, debris flows, and decreased channel stability. Either increasing the size of a culvert or the crossing structure or removing the drainage structure would reduce the chance that a fill may fail as a result of lack of capacity. Providing flow

relief or overflow culverts or other structures in the event of excess streamflows or blockages also would reduce the chance of failure.

Armored bypass installation: Installation of armored bypass dips reduces the risk that the fill would enter the stream if a culvert plugs or flow exceeds its capacity. The armored dip is designed to allow water to flow over the road without eroding the fill. As with any construction or restoration activity, there is a chance that some incidental fine sediment would enter the stream in the short term. This incidental loading would be far overshadowed by the long-term and pronounced reduction of risk from the failure of the crossing.

Stream crossing maintenance or upgrade: Regular maintenance of stream crossings would reduce sediment delivery to streams. Additional cross drainage structures installed away from the live stream would capture sediment coming from the road surface and ditch and reroute it to the forest floor. This would not eliminate sediment delivery, but would reduce the amount currently delivered to the stream.

Effects of Installation of Relief Culvert Crossings

Installation of relief culverts would reduce the timing, magnitude and quantity of surface runoff because runoff from the ditch line would be dispersed and allowed to infiltrate into the forest floor. The dispersion of surface runoff would help "normalize" the flow regime of a basin by recharging the groundwater. The groundwater would slowly release into the live streams.

Effects of Increased Sediment due to Road Use

Use of roads during project activities would increase sediment delivered to streams. The heavy use of vehicles, mainly logging trucks, and frequent surface blading of the road surface would increase the amount of sediment eroded during summer rainfall events. Some of this sediment may be delivered to the stream where the road is near the stream or when runoff is carried down a ditch line. The amount of increased sediment would be expected to be immeasurable and would not reduce water quality or affect stream condition.

Effects of Stream Crossing Failures on Sustained Grade Roads

Stream crossings on steep sustained grades are sometimes inadvertently installed. At these crossings, the downhill approach of the road is lower than the road surface at the stream crossing. When the structure is blocked by debris or its capacity somehow is exceeded, the water overtops the pipe and begins flowing down the road. Instead of flowing directly over the road and back into the channel, it flows downslope on the road or in the ditch line until an obstruction, such as a low point in the road, forces the flow across the road surface and onto the fill. The water often erodes the road surface, causing gullies in the road tread, road fill, and the slope below the fill as the water travels back to the stream. The amount of sediment delivered to the stream from this type of erosion would exceed the amount of sediment delivered from only the stream crossing failure and would include erosion from the crossing, the ditch line, the road prism and the fill. In some cases, failure of a crossing and subsequent overflow can initiate mass failure of the hillslope above the failure.

Flow relief drivable and hardened dips can be installed at stream crossings where flows could escape as described down the road. This would reduce the amount of sediment delivered to the stream for the long term. Some sediment may be delivered to the stream during installation of the dips, but the amount would be small and not expected to reduce water quality or alter stream condition.

General Effects of Stream Crossing and/or Large Fill Failures

When large fills fail, such as at stream and draw crossings or at encroaching roads, they often inundate the stream with quantities of sediment that cannot easily be flushed through the stream. The deposited materials

tend to remain intact as a mass or 'slug' of sediment that can severely alter smaller streams by filling both channel pools and flood prone areas. The result is a loss or inhibition of important channel elements and functions that are necessary to retain the dynamic equilibrium of the stream and to support beneficial uses of the water. As the sediment mass moves downstream and enters larger streams, the sediment begins to disperse, thereby reducing the channel effects of the single failure. Multiple failures can combine and result in long-term adverse channel effects downstream.

General Localized/Site Scale Effects to Sediment Delivery

No sediment would be expected to be delivered to streams from logging yarding activities because of the implementation of Best Management Practices. Yarding activities also would be located beyond the riparian areas of streams or lakes. Undisturbed lands between all logging activities and Riparian Habitat Conservation Areas (RHCAs) would trap any sediment that may reach the margins of disturbed areas (Belt, G.H., et al)[1]. All landings would be located outside of RHCAs and designed to minimize the risk of sediment delivery and to prevent mass failure potential. These mitigation measures are included in Chapter II.

Protecting Desirable Stream Temperatures

Water temperature is the principal regulator of biological activities for aquatic organisms and often the limiting factor in their survival. Stream temperatures are a function of a variety of factors including some inherent to a stream and others which may be manipulated by management activities. The temperature of a stream is a function of the following variables: direct solar radiation, orientation of the channel, site topography, substrate color, groundwater contribution and dilution with other streams. Direct solar radiation is the main factor that can be altered by management activities. Research has documented that the single greatest means of increasing stream temperature is to remove that portion of the riparian vegetation that blocks direct solar radiation.

The proposed Douglas-fir beetle project activities would not impact existing stream temperatures. Field reviews suggest that the number of dead and dying riparian trees is very low and that these trees are scattered throughout stream basins. There would be no harvesting of riparian trees *except* when new stream crossings are constructed. When new roads approach streams, trees would be removed to allow for road construction There are very few stream crossings proposed in the Douglas-fir beetle project. This limited amount of streamside manipulation would not increase water temperature at the site nor would it be detected cumulatively downstream because there would be so little removal in any one basin.

Methodology

For purposes of comparing alternatives and analyzing the effects of each alternative, a table of watershed effects is presented. A table was developed for each analysis watershed. These effects include, but are not limited to, watershed restoration activities. The methods used in this section are the same as were used in the Affected Environment.

The table consists of measurement indicators and their units of measure, and the estimate of that parameter over the periods of time during and following the project for each alternative. The table is followed by a narrative discussion of direct, indirect, and cumulative effects in each watershed at the appropriate spatial and temporal scale. For a more detailed explanation of the indicators used, please refer to the "Watershed Hydrologic Response Estimates and WATSED" discussion in the "Affected Environment" section.

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[1]*Belt, G.H.; O'Lauglin, J.; Merril, T. 1992. Design of forest riparian buffer strips for the protection of water quality: analysis of scientific literature. Idaho Forest, Wildlife and Range Policy Analysis Group. Idaho Forest, Wildlife and Range Experiment Station, University Idaho. Report No. 8. June 1992.*

Sediment Yield Percent is the estimated annual sediment loading for the watershed and reported as the percent change above the estimated natural sediment yield for the watershed. The percent can be compared to the Current Sediment Load Modification listed in the tables in the Affected Environment section. Sediment yield percent is calculated for each alternative using the WATSED model. The proposed timber harvest units, construction and reconstruction of both system and temporary roads, and site preparation treatments are included in the analysis. The reasonably foreseeable actions which are included as Appendix E are also calculated in the analysis. It does not estimate the reduction in sediment from watershed restoration projects. The model was run for the period 1998-2008. The tables displays the conditions in the year 2006, which was used because the timber harvest and related activities would be completed by then, as described in the "Watershed Hydrologic Response Estimates and WATSED" discussion in the "Affected Environment" section.

Peak Flow represents the change in runoff, and is expressed for each watershed as a percent change from the estimated "natural" peak month discharge. The WATSED model also was used for this analysis to estimate the effects of the proposed timber harvest, road construction and reconstruction, and fuel treatment activities. Future actions are also included in the analysis. The peak flow can be compared to the existing peak flow displayed in the tables in the Affected Environment section.

Net Stream Crossings reflects the change in the number of stream crossings compared to the existing conditions as described in the "Watershed Characteristics, Condition Indicators, and Dominant Watershed Disturbances." tables. These values can increase in an alternative due to new road construction or decrease in number due to watershed restoration actions. Reasonably foreseeable actions are included in the analysis. Stream crossings can cause sediment to be introduced into the stream, modify the streamflow, or cause migration barriers to fish movement.

Net Associated Risk displays the anticipated change in sediment risk associated with stream crossings which were inventoried within the scope of this project. The inventory did not include all stream crossings within each analysis area, and was focused on high-risk stream crossings. The associated risk is presented in terms of tons of sediment per year as discussed in the earlier tables displaying "Watershed Characteristics, Condition Indicators, and Dominant Watershed Disturbances." This figure was calculated based on measurements or estimates of road fill located at stream crossings. Crossings that would be eliminated or upgraded would reduce net associated risk. This issue indicator is important in assessing watershed improvement work associated with the alternatives. The associated risk of the uninventoried stream crossings is not included in the reported value. The removal of these uninventoried stream crossings would further reduce the sediment risk.

Net Roads reflects the change in road mileage for a watershed. These values can increase in an alternative due to proposed or foreseeable permanent road construction or decrease due to watershed restoration actions. Proposed temporary roads are not included in this calculation because they would be removed following project activities. This value is an indicator of change to watershed risks associated with roads.

Net Encroaching Roads shows the net change in miles for inventoried roads which hydraulically modify streamflows at bankfull stage. Encroaching roads also are a source of sediment. Current encroaching roads miles by watershed are displayed in the "Watershed Characteristics, Condition Indicators, and Dominant Watershed Disturbances" tables. Restoration actions such as road obliteration can reduce this value and lead to improvements within the watershed.

In the Draft EIS, five additional parameters were initially identified. However, they were found not to be driving variables within the scope of this project. These parameters include the number of road crossings per mile of stream (crossing frequency); the percent of hydrologic openings in a watershed; the percent of stream miles modified by encroaching road (GIS roads within a 50-foot buffer of the GIS stream layer); the miles of those modified reaches that have reduced the potential for direct shade to the stream reach (direct shade reduction); and road density.

Direct, Indirect and Cumulative Effects at the Analysis Area (Watershed) Scale

Watson/Priest Lake Face Analysis Area

Cumulative Watershed Scale Effects for Watson/Priest Lake Face

For the purposes of this cumulative effects analysis, the Watson/Priest Lake Face Analysis Area encompasses a series of unnamed, low-order tributary streams, Tango Creek and slopes that drain directly into the northwest end of Priest Lake. Most of the project area is actually a group of very small and independent watersheds that do not coalesce or drain through a common main stream like most of the watershed-scale analysis areas in this project. As part of the larger cumulative effects analysis for the Watson/Priest Lake Face area, Art's Project was the only foreseeable timber sale planned to occur.

Under all action alternatives harvesting would be by helicopter, (Alternative D also would have some skyline logging proposed). No disturbance of sensitive soils by logging would occur under any action alternative. The proposed watershed restoration work would focus upon the removal of several miles of high risk road that cuts across sensitive, dissected slopes above Distillery Bay. Application of site specific BMPs (i.e. coffer dams, mulching, etc.) at the time of the restoration project would greatly reduce the amount of sediment that would be delivered by the activity.

Becauseso many of the streams within the larger Watson Area are small first order streams that do not join one another, there would be no cumulative watershed-scale effects anticipated. With the substantial net reduction of sediment risks from restoration relative to the limited short-term risks incurred by the logging activities, there would be a net improvement overall toward protecting water resources and values in the local streams and the lake below it. Stream temperature would not be expected to change under any alternative. No harvest would occur where shade would be affected under any of the action alternatives.

Table III-172. Projected watershed response in the Watson/Priest Lake Face Area Watershed, by alternative.

WATERSHED NAME: Watson/Priest Lake Face HUC:1701021513

Measure of change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	31	31	31	31	31	31	31
Peak flow (%)	3	3	3	3	3	3	3
Net stream crossings (#)	0	-4	-4	-4	-4	-4	-4
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Net encroaching road (miles)	0	0	0	0	0	0	0

Note: The sediment yield and peak flow change estimates in the table represent the cumulative expected responses as a result of forest management activities over time and throughout the watershed represented. The estimates assume standard BMPs and Soil and Water Conservation Practices are employed. The four "net change" lines in the table are an accounting of the driving disturbance and restoration elements in this project. When non-standard site-specific BMPs and restoration practices associated with these alternatives are incorporated into the analyses, the synthesis of these analyses yields the conclusions of cumulative, direct, and indirect effects that follow.

Direct and Indirect Tributary Effects for Watson/Priest Lake Face

Reduced sediment sources would be a direct effect of stabilizing roads and associated crossings in the area. Removal of the high risk crossings associated with roads 2249 and 2249a would provide direct benefits to these small streams by reducing the amount of sediment that is delivered from the existing road prism and ditchline. Indirect effects would be less risk of road failures that could result in sediment pulses which could accumulate behind obstructions in a stream. No atypical effects at the local or site level were identified during the analysis.

Summation for Watson/Priest Lake Face

Tango Creek is listed as Water Quality Limited in Idaho because of nutrients and sediment. There would be no net addition in these two pollutants. Under even the most intensive proposed action alternative, less than 2.0 acres would be treated. All action alternatives would further reduce the few water quality risks that are present in the area through road improvement projects (i.e. reconstruction of Road 638).

Granite Creek Analysis Area

Cumulative or Watershed Scale Effects for Granite Creek

The cumulative effects analysis area for the Granite Creek Analysis Area is the entire Granite Creek watershed upstream from its confluence with Priest Lake. Within the larger analysis area, the following smaller drainages were assessed for effects: South-Facing tributaries along lower Granite and Lower Main Granite. A separate effects analysis was completed for the South-Facing tributaries along lower Granite and the analysis area referred to as Lower Main Granite. The other analysis areas, North Fork of Granite and South Fork of Granite, were assessed using the WATSED model and were not further analyzed because there would not be any actions planned under this project within these subdrainages.

The cumulative effects analysis for the Granite Creek drainage is a synthesis of watershed modeling, field surveys and professional judgement. As part of the larger cumulative effects analysis for the Granite Creek drainage, the following foreseeable timber activities were assessed: Art's Project , Fedar White Pine, Stimson Timber Company harvesting in Sema and South Fork Granite. Foreseeable road improvement projects include some watershed restoration work in the Dusty Peak Timber Sale Area, repair of Road 638C and road surfacing for Road 302.

The WATSED model was used as an assessment tool to display the potential increases in water or sediment yield should any of the alternatives be implemented. Analysis and field inventories do not indicate enhanced peak flows occurring or causing any instream effects. Sediment yield appears to be elevated, but the watershed system and its stream network are handling it without adverse effects. At the large watershed scale, there would be no predicted increases or decreases in water or sediment yields from implementation of any action alternative. The majority of the proposed timber harvesting and restoration efforts proposed for this analysis area are located in the lower portion of the larger Granite Creek basin. The proposed watershed restoration projects would provide measurable improvements in the smaller tributaries of Granite Creek. In some instances, the proposed improvements could reduce potential sediment delivery to the mainstem of Granite Creek by almost 10 tons.

Local improvements to water quality and water resource values would be realized after project activities are complete. None of the alternatives would likely result in changes in the timing, magnitude, and quantity of flows in Granite Creek and would not change stream stability nor increase flood risk. No detectable changes in peak flows would occur. Any change in run-off is primarily the result of tree mortality due to the Douglas-fir beetle. No measurable difference in water yield exists between the No-Action Alternative and any of the proposed action alternatives. None of the alternatives would adversely impact water quality in

Granite Creek. All of the proposed action alternatives would reduce the risks associated with some of the roads in the watershed.

Table III-173. Projected watershed response in the Granite Creek Watershed, by alternative.

WATERSHED NAME: Granite Creek Watershed	HUC:1701021506

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	108	108	108	108	108	108	108
Peak flow (%)	8	8	8	8	8	8	8
Net stream crossings (#)	0	-2	-2	-2	-2	-2	-2
Net associated risk (tons/year)	0	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9
Net roads (miles)	+1.8	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Effects for Granite Creek

A direct effect would be a net reduction in sediment delivery to Granite Creek tributary streams and the main stream upon implementation of any action alternative. This reduction is primarily a direct effect of road obliteration and removal of fill at stream crossings. Some indirect improvement in stream condition would be expected. Short-term sediment delivery from harvest and road-related activities would likely be small (unmeasureable within Granite Creek), and would have no effect on water quality, stream stability or stream condition. Site specific BMPs and adherence to the Inland Native Fish Strategy during logging related activities would eliminate or sharply curtail any direct delivery of sediment to streams. All restoration projects would have site specific BMPs designed to reduce the delivery of sediment or any disturbance to the streams. Within this project, rehabilitation and harvest activities would occur in tributaries which feed the lower third of Granite Creek.

Tributaries in the Lower Granite Creek watershed would demonstrate the most measureable watershed response in the whole basin. Peak flows in tributaries may be indirectly and slightly elevated, as would sediment loading in Alternatives B, C, D, E, and F. However, a recovery trend appears to be in place for both hydrologic characteristics and it would continue nearly unchanged as a result of the logging under the action alternatives. There would be relatively few acres proposed for treatment under any action alternative and no road construction is proposed under any action alternative. There is some additional road development planned based on an earlier management decision and analyzed under Alternative A, but this does not appear to be creating any additional risks and would not be expected to delay recovery.

Under the No-Action Alternative, existing risks to the watershed would continue. The effects of the lack of improvements would be continued risk of road failures and the potential for large volumes of sediment to be delivered to the streams.

South-Facing Tributaries of Lower Granite

Cumulative Effects for the South-Facing Tributaries of Lower Granite

The cumulative effects of this analysis area includes the following named drainages: Fedar, Jost, Blacktail, Packer and Zero. Timber projects that were included in the cumulative effects analysis were Fedar White Pine Timber Salvage, the road side timber salvage known as Art's project, and the larger Dusty Peak Timber Sale. Scheduled road repair and improvement work would be completed in the summer of 1999 in the Dusty Peak project area and on Road 638C. As in the larger cumulative effects analysis, the analysis of effects includes use of the WATSED model, field reviews and professional judgement. The WATSED model

was used to assess the effects of the proposed harvest and associated activities. No changes in water or sediment yield would be anticipated unde any alternative. The restoration benefits were not addressed with the watershed model. Instead mathematical calculations show that should any of the action alternatives be implemented then there would be a risk reduction of 9.9 tons provided by correcting several crossings in the Fedar Creek drainage. There is a possibility that restoration activities in Fedar Creek may indirectly reduce or eliminate a beaver pond area behind a high-risk road. Beavers have used the road fill as part of their dam and blocked the drainage culverts to flood an area above the road. The pond is dependent on the road. Should the crossing be removed, this artificial wetland could be reduced in size. However, if the crossing should fail in the near future, not only would the wetland be completely drained but the mainstem of Fedar would be severely impacted. In addition to the measurable reduction in future sediment risk by such projects as the correction of the large crossing on Fedar Creek, there would also be a reduction of other risks with the elimination of 3.0 miles of road. None of the restoration would occur if Alternative A were implemented. Sediment delivery to streams would decrease under all alternatives except the No-Action Alternative.

Table III-174. Projected watershed response in the Granite Creek Watershed (South-Facing Tributaries along the Lower Granite Creek), by alternative.

WATERSHED NAME: Granite Creek Watershed	HUC:1701021506
TRIBUTARY: South Face tributaries along lower Granite Creek	HUC: 170102150600

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	136	136	136	136	136	136	136
Peak flow (%)	5	5	5	5	5	5	5
Net stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Net associated risk (tons/year)	0	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9
Net roads (miles)	+0.9	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Effects of South-Facing Tributaries of Granite Creek

The proposed logging under any of the action alternatives would not directly deliver sediment to any streams because of the site specific BMPs and the implementation of the Inland Native Fish Strategy guidelines. The indirect increase in water yield would not differ between the action and No-Action Alternatives because of the greater relative amount of dead and dying trees proposed for removal. Some indirect short-term responses from the proposed logging strategies (e.g. yarding methods, silvicultural prescriptions, and road work) under all action alternatives would elevate peak flows slightly in some of the south facing tributary watersheds in lower Granite Creek, based on project-related activities and other foreseeable or ongoing activities in the area.

The degree of watershed restoration associated with all action alternatives would result in a direct and pronounced reduction of risk and sediment loading over both the short and long term. There would be different direct and indirect effects between the action and No-Action Alternatives for the proposed restoration projects. Should any of the action alternatives be implemented there would be a short term increase in sediment delivered to the stream as described in the earlier environmental consequences section where work occurs at channel crossings. The amount of sediment would be very small compared to the long-term reduction in potential sediment delivery should the No-Action Alternative be implemented. With the proposed watershed restoration, the indirect effect on tributary streams and water resources would be less movement and redistribution of sediment throughout the tributary systems in a relatively short period of time than what would occur under Alternative A. Rapid mass loading associated with episodic road and crossing failures would be substantially reduced, resulting in potentially less channel adjustments that cause excessive bank erosion and loss of aquatic habitat.

The watershed restoration activities proposed under all alternatives would directly and substantially reduce sediment sources and the risk of failures. The condition of local stream channels would improve within several years of the restoration. Channel shifting would be reduced because the channels would experience less intense sediment loading and much less sediment from mass erosion.

Lower Main Granite Creek Tributaries

Cumulative Effects for the Lower Main Granite Creek Tributaries

The cumulative effects of this analysis area includes the relatively small tributaries flowing into the main-stem of Granite Creek off of the north-facing slopes. The analysis of effects includes use of the WATSED model, field reviews and professional judgement. The WATSED model was used to assess the proposed logging associated activities and the model results suggest that there would be no changes in water or sediment yield should any alternative be implemented. The restoration benefits were not addressed with the watershed model. As part of the sale, several miles of Roads 2245 and 1347a would be eliminated. This restoration work would reduce the risk of sediment delivery to these small tributaries flowing into Granite Creek. None of the restoration would occur if Alternative A were implemented. The majority of the proposed timber harvesting would be completed using helicopter logging and therefore there would be no disturbance of sensitive soils and no construction of temporary roads.

Table III-175. Projected watershed response in the Granite Creek Watershed (Lower Main Granite Creek Tributary), by alternative.

WATERSHED NAME: Granite Creek Watershed	HUC:1701021506
TRIBUTARY: Lower Main Granite Creek	HUC: 170102150600

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	228	228	228	228	228	228	228
Peak flow (%)	12	13	13	13	13	13	12
Net stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	+0.9	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Effects on Lower Main Granite Creek Tributaries

The proposed logging under any of the action alternatives would not directly deliver sediment to any streams because of the site specific BMPs and the implementation of the Inland Native Fish Strategy guidelines. The indirect increase in water yield would not differ between the action and No-Action Alternatives because of the large percentage of dead and dying trees proposed for removal.

Most of the timber harvesting would occur in a small unnamed tributary just east of Media Creek. Still given the BMPs and the lack of ground disturbance, even the intensive treatment (about 30% of the total watershed) proposed for this small drainage would not change existing channel conditions. The proposed road obliteration would have some immediate delivery of sediment to the small tributaries, though not enough to alter the channel morphology nor would any sediment reach the mainstem of Granite Creek. The sediment would not reach the mainstem of Granite Creek because of the distance between Granite Creek and the disturbance sites.

Summation for the Granite Creek Watershed

The watershed and water resource objectives of the project would be met under all action alternatives. For all alternatives there would be a net improvement to watershed and water resources by virtue of reduction of the risk of sediment loading in both the short and long term at certain crossings and on unstable roads; and through the elimination of some road segments that are currently encroaching on the stream or its active flood prone area.

Bismark Mountain Area Analysis Area

Cumulative or Watershed Scale Effects for Bismark Mountain

The cumulative effects analysis of the Bismark Mountain area is defined by a small unnamed tributary in the lower Kalispell Creek watershed. There is no surface water connection between the tributary and Kalispell Creek; however, streamflows from the unnamed tributary probably enter Kalispell Creek via subsurface connections. The tributary watershed is considered to be functioning properly with some adverse disturbances that are inhibiting its full recovery.

The watershed and water resource objectives of the project would be met under all action alternatives. There would be a net improvement to watershed and water resources by virtue of reduction of the risk of sediment loading in both the short and long term at certain crossings; and through the elimination of some road segments. Substantial local improvements to water quality and water resource values would be realized after project activities are complete. No detectable changes in water quality would occur.

Table III-176. Projected watershed response in the Kalispell Creek Watershed (Unnamed Tributary near Bismark Mountain), by alternative.

WATERSHED NAME: Kalispell Creek	HUC: 1701021505
TRIBUTARY: Unnamed Tributary near Bismark Mountain	HUC: 170102150505

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	174	174	174	174	174	174	174
Peak flow (%)	4	4	4	4	4	4	4
Net stream crossings (#)	0	0	0	0	0	0	0
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Effects for Bismark Mountain

The extent of the logging activities proposed under all action alternatives would have no effect on any water resources in the tributary. The proposed units are small and isolated from any live water or areas of delivery, and are located on low-risk landtypes. There would be no measurable change in the unnamed tributary or to Kalispell Creek under any alternative. The tributary flows sub-surface before reaching Kalispell Creek. No sediment can be transported past this point, and changes in the quantity and magnitude of flows are moderated by the sub-surface travel. The action alternatives would reduce the risk of sediment loading to the tributary from some existing road segments that are contributing sediment. The response of the stream would be enhanced recovery from some existing small erosion sources. No atypical local or site-level effects were identified during the analysis.

Summation for the Bismark Mountain Area

Kalispell Creek (within Idaho) is listed as a Water Quality Limited Stream segment due to sediment; the tributary within the Bismark Mountain Area is not listed. Should any alternative be implemented, there would be no increase in sediment (the pollutant of concern) to Kalispell Creek.

Lamb Creek Analysis Area

Cumulative Watershed Scale Effects for Lamb Creek

The cumulative effects analysis area of Lamb Creek is the drainage upstream of the confluence with ~~the~~ Priest River. The effects of the proposed alternatives would not be detectable beyond this point. The cumulative effects of the proposed action alternatives on the water resources of Lamb Creek are presented below. The effects at the tributary scale include detailed discussion of the following tributaries of the larger Lamb Creek drainage: unnamed triburary to North Fork of Lamb Creek , North Fork of Lamb Creek and Upper Lamb Creek. As part of the larger cumulative effects analysis for the Lamb Creek drainage, the following foreseeable timber activities were assessed: Lakeface-Lamb and South Gleason Ponderosa Pine. Foreseeable road improvement projects include repairing past flood damage on a small portion of Road 310. Within the larger Lamb Creek drainage there is one federally managed grazing allotment.

The Lake Face Lamb Project is a possibly foreseeable action that may also occur in the Lamb Creek in the near future. This is a fuels reduction project that has been independently evaluated, and has been evaluated in relation to the proposed Douglas-fir beetle project activities. It would not contribute any measurable effects, by itself or cumulatively, under any alternative in terms of water quality or water resource values.

The watershed model that was used as part of the overall cumulative effects analysis suggests that at a watershed scale, logging-related actions under all action alternatives would not contribute measurable sediment or peak flow increases. A thorough analysis of the data and stream surveys shows that there has been severely elevated sediment loading and some peak flow increases from past disturbances in the watershed. The amount of increase that would occur would be small, and would not likely measurably increase stream damage. Increases in flow would be a result of tree mortality due to the Douglas-fir beetle attack. Additional harvest of green timber in the basin would not be expected to measurably increase peak flows over the effects of the beetle-related tree mortality. Removal of 2.3 miles of road as proposed under the action alternatives would decrease the magnitude of smaller peakflows somewhat. The change in peak flow would not be measurable at the lower reaches of Lamb Creek. Currently, there is a pronounced recovery trend in progress for both peak water and sediment yields. This improving trend would be somewhat enhanced under all alternatives for sediment, and would not compromise the peak flow recovery trend.

Implementation of any alternative would not affect wetlands, land uses or water temperature. Water temperature would not be expected to change under any alternative. No harvest would occur where shade would be affected under any action alternative.

In comparing the effects of the various action alternatives upon the water resources of Lamb Creek, there appears to be no differences in terms of the watershed prediction model. The model was used as a tool to to access the effects of the proposed timber harvesting and temporary road construction as it affected sediment and water yield at the watershed scale. The model did not ascertain measurable differences between any of the action alternatives or the No-Action Alternative. Even though proposed Alternative D would treat the greatest amount of acres through timber harvesting, the model did not present a difference in predicted water or sediment yield when compared to the otheraction alternatives. The lack of difference among ~~between~~ the alternatives is attributed to the lack of soil disturbance that would occur and the project's focus of mostly removing dead and dying timber. Alternatives B, C and E propose treating almost 25% less acreage than would Alternative D. Alternative F proposes a level of timber treatment that is only slightly less than that proposed by alternative D. All of the alternatives, except alternatives C and G propose

construction of temporary road. The model was not used to address the effects of the proposed restoration efforts. In reviewing the proposed restoration effort, alternatives B, C, D and E share the same restoration plan. The restoration of slopes by removing road templates would yield a net decrease in sediment loading in the upper watershed. There would be less effective restoration accomplished under alternatives F and G and no restoration accomplished under Alternative A. Restoration under alternatives B, C, D and E would include obliteration of 2.3 miles of road.

There would not likely be any change in the sediment or flow regime from the implementation of any of the action alternatives. Site specific Best Management Practices coupled with strict adherence to the Inland Native Fish Strategy would effectively reduce any potential delivery of sediment to the streams. Less than 20 percent of the Lamb Creek drainage is located on sensitive landtypes. The potential impacts of the proposed action alternatives on these landtypes would be limited since only an estimated 23 acres of ground disturbance would occur under even the most intensive timber harvest proposal. The units on sensitive landtypes are located far from draws, providing an effective buffer and no delivery of sediment to streams. Though the construction of temporary road and timber harvesting would affect a relatively small amount of sensitive landtypes, the risk of sediment delivery to any stream would be minimized through the application of site specific BMPs, adherence to the Inland Native Fish strategy and the distance of the units to flowing streams. Any increases in stream peak flows would not differ between the No-Action Alternative and any action alternatives since the majority of the timber being removed is dead or dying. The proposed obliteration and road maintenance would reduce the risk of slope failure and minimize any sediment that may be delivered to tributaries of Lamb Creek.

Table III-177. Projected watershed response in the Lamb Creek Watershed, by alternative.

WATERSHED NAME: Lamb Creek							HUC:170102150407
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment yield (%)	222	222	222	222	222	222	222
Peak flow (%)	6	6	6	6	6	6	6
Net stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	0	-2.3	-2.3	-2.3	-2.3	-1.2	-2.3
Net encroaching road (miles)	0	0	0	0	0	0	0

Note: The sediment yield and peak flow change estimates in the table represent the cumulative expected responses as a result of forest management activities over time and throughout the watershed represented. The estimates assume standard BMPs and Soil and Water Conservation Practices are employed. The four "net change" lines in the table are an accounting of the driving disturbance and restoration elements in this project. When non-standard site-specific BMPs and restoration practices associated with these alternative are incorporated into the analyses, the synthesis of these analyses yields the conclusions of cumulative, direct, and indirect effects that follow.

Direct and Indirect Tributary Effects for Lamb Creek Tributaries

The direct and indirect effects of the proposed actions on the tributaries would be very localized. Given that mostly dead and dying timber would be removed there would be no difference in water yield between the no action and action alternatives. On those small streams where road obliteration would occur, there would be short-term (less than a season) increase in sediment delivery to the channel. The amount of sediment would not be measurable beyond the affected site because of buffering and trapping of sediment by downed wood on the forest floor. The proposed temporary road construction within the Lamb Creek drainage would not cross any flowing streams and therefore no sediment delivery would occur from the temporary road construction or obliteration. The proposed harvesting of timber on sensitive lands adjacent to the first order streams in the lower end of Lamb Creek-would yield minimal increases in sediment given that BMPs and the Native Inland Fish Strategy would be applied. Any sediment that reached the stream would be filtered over the almost one half of a mile of distance between the proposed unit and the mainstem of Lamb Creek.

<u>#5 Unnamed Tributary to North Fork of Lamb Creek:</u> This drainage is located northwest of the North Fork of Lamb Creek. Under Alternative D, there would be over 200 acres of salvage harvesting using a helicopter. There would be only very minimal harvesting under proposed under Alternatives B, C and E and no harvesting proposed under Alternative G. Under all alternatives there would be 0.5 miles of road obliteration. There would be no direct effects to the streams from harvesting because there would be no soil disturbance. Indirectly there would be a small increase in water yield, but this amount of increase would not differ from the No-Action Alternative. The proposed road obliteration would have a short term increase in sediment delivery at the stream crossings. However, the sediment would get filtered in the seasonally flowing streams and would not reach the mainstem of Lamb Creek.

<u>North Fork Lamb Creek:</u> Under Alternative D, about 200 acres would be harvested using a mix of helicopter and tractor. The focus of the harvesting would be salvaging dead and dying timber with some removal of green timber. Alternatives B. C and E would propose helicopter and tractor harvesting of over 55 acres of timber. There would be no harvesting under alternatives F and G. There would be no watershed restoration under any of the alternatives. There would be no direct effects of implementing Alternative D (the most intensive alternative). There would be no difference in water yield between the No-Action Alternative and any of the action alternatives.

<u>Upper Lamb Creek:</u> Under Alternative D, salvage would occur on about 20 acres using helicopters. There would be no disturbance of sensitive landtypes. No timber harvesting would occur under any of the other alternatives. Given this amount and type of proposed timber harvesting, there would not be any direct or indirect effects resulting from the implementation of Alternative D.

Summation for the Lamb Creek Watershed

None of the action alternatives is anticipated to adversely impact water quality or watershed conditions. No increase in sediment delivery to streams would be expected from yarding and landing construction and road use. The condition of wetlands within Lamb Creek would not change as a result of upstream management. Of the proposed alternatives, Alternative D is the most aggressive in improving existing conditions, whereas Alternative A would not improve current conditions that are adversely impacting Lamb Creek. The level of improvement to the existing condition is important especially since Lamb Creek is listed as a Water Quality Limited Segment in Idaho due to sediment. There would be no net increase in sediment under any alternative that caused the segment to be listed in Idaho

<u>Binarch Creek Analysis Area</u>

Cumulative Watershed Scale Effects for Binarch Creek

The cumulative effects analysis area of the Binarch Creek drainage is the watershed above the confluence of the mainstem of the creek with the Priest River. The effects of the proposed alternatives would not be detectable beyond this point. As part of the larger cumulative effects analysis for the Binarch Creek drainage, the foreseeable Lakeface-Lamb timber activities were assessed. The cumulative effects of the proposed action alternatives on the water resources of Binarch Creek are presented below.

The cumulative effects analysis indicates that there have been elevated potential sediment sources and increases to peak flows from past forest practices in the watershed, and there is a recovery trend in progress for both of these elementary watershed response characteristics. These trends would continue under all alternatives. A net reduction in sediment delivery and risk of road failures would occur under all action alternatives for Binarch Creek, based on the rehabilitation of slopes affected by some high-risk road segments. The implementation of Best Management Practices (BMPs) and adherence to the Inland Native Fish Strategy would provide protection for riparian habitat and control the majority of the sediment associated with these activities. Stream temperature would not be expected to change under any alternative. No harvest would occur where shade would be affected under any action alternative.

The WATSED model was used as a tool to assess the effects of the proposed timber harvesting and temporary road construction and found very small differences in terms of cumulative effects for any of the action alternatives. In comparing the effects of the various action alternatives upon the water resources of Binarch Creek, there appears to be subtle differences in the amount and type of timber harvesting and the amount of road work. Alternatives B and E have the same logging methods and total treated acres. Alternatives C, D and F are all unique in terms of logging. Alternative D had the greatest amount of harvesting of all the action alternatives and Alternative F had the least amount of acres treated. Alternatives B, D and E all propose the same amount of temporary road construction. Alternatives C, F and G had no proposed temporary road construction and Alternative E had very little relative proposed temporary road construction. The model was not used to address the positive effects of the proposed restoration efforts. In terms of restoration, Alternatives D, F and G are unique: Alternative D proposes the greatest amount of restoration. The reason that Alternative G has less restoration than Alternative D is because when Alternative G was developed, only those projects that had the maximum restoration value were included in the alternative. Under the other alternatives any feasible restoration project was included. Alternatives B, C and E also propose restoration projects but at a lesser degree.

Based on the watershed model estimates, no changes would be anticipated in the sediment or flow regime under any of the action alternatives. Under Alternatives B, C, D and E, ground-disturbing logging is proposed on about 30 acres of sensitive landtypes. A review of topography maps shows that the units associated with more sensitive landtypes are not close to year round flowing streams and therefore there would not be any delivery of sediment to any stream. The risk of sediment delivery would be minimized through the application of site specific BMPs, adherence to the Inland Native Fish strategy and the distance of the units to flowing streams. Estimated increases in peak streamflows would not result in different instream effects between the No-Action Alternative and any action alternatives. The proposed obliteration, reconstruction and road maintenance would reduce the risk of slope failure and minimize any sediment that may be delivered to tributaries of Binarch Creek.

Table III-178. Projected watershed response in the Binarch Creek Watershed, by alternative.

WATERSHED NAME: Binarch Creek	HUC: 170102150405

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	100	102	100	102	102	100	100
Peak flow (%)	11	12	12	12	11	12	11
Net stream crossings (#)	0	0	0	0	0	0	0
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	0	-0.5	-0.5	-0.5	-0.5	-0.1	-0.5
Net encroaching road (miles)	0	0	0	0	0	0	0

Note: The sediment yield and peak flow change estimates in the table represent the cumulative expected responses as a result of forest management activities over time and throughout the watershed represented. The estimates assume standard BMPs and Soil and Water Conservation Practices are employed. The four "net change" lines in the table are an accounting of the driving disturbance and restoration elements in this project. When non-standard site-specific BMPs and restoration practices associated with these alternative are incorporated into the analyses, the synthesis of these analyses yields the conclusions of cumulative, direct, and indirect effects that follow.

Direct and Indirect Tributary Scale Effects for Binarch Creek

The majority of the tributaries flowing into Binarch Creek flow seasonally or in response to rainstorms or snowmelt. The direct and indirect effects of the proposed actions on the tributaries would be very localized. Given that mostly dead and dying timber would be removed, no difference in water yield would exist between the No-Action and action alternatives. On those small streams where road obliteration or road restoration would occur, there would be a direct effect of a short-term (less than a season) increase in sediment delivery to the channel. The majority of sediment would be controlled through the implementation of BMPs. The amount of sediment would not be measurable beyond the affected site. Where temporary

roads are proposed, there may be a longer time period whereby sediment is actively delivered to seasonally flowing streams. Although these temporary roads would be recontoured within one year of their use (design criteria), they would be potential sources of sediment for up to one year plus at least one season after they are obliterated. Any sediment generated off temporary roads would not reach the mainstem of Binarch Creek because of the ability of the seasonally flowing channels to filter sediment.

The wetlands complex of beaver ponds in Binarch Creek and the existing Research Natural Area (RNA) would be fully protected from the perspective of watershed and water resources under all alternatives. Wetlands, primarily associated with the stream in an established Research Natural Area are maintained by beaver activity. Both the integrity of the wetlands and the Research Natural Area would be maintained under any alternative through the application of the Inland Native Fish Strategy.

Summation for the Binarch Creek Watershed

None of the action alternatives would adversely impact water quality or watershed conditions. Of the proposed alternatives, Alternative D would result in the most improvement in watershed conditions because of the amount of restoration. Whereas Alternative A would not improve existing conditions that are adversely impacting Binarch Creek. The level of improvement to the existing condition is important especially since Binarch Creek is listed as a Water Quality Limited Segment in Idaho due to sediment. Under all alternatives, there would be no net addition of sediment under any alternative that caused the segment to be listed in Idaho.

Upper West Branch Analysis Area

Cumulative Watershed Scale Effects for the Upper West Branch

For the purposes of this analysis, the Upper West Branch of the Priest River was divided into four smaller units for watershed modeling: 1) Upper West Branch headwaters, 2) Upper West Branch Mainstem, 3) Galena and 4) Goose. For the cumulative effects analysis each of these units were combined to provide for the cumulative effects analysis for the proposed alternatives. For each of the smaller units a cumulative effects analysis will also be presented.

Cumulative Effects for the Upper West Branch at the Watershed Scale

The cumulative effects analysis area of the Upper West Branch Creek drainage includes the entire drainage from the headwaters down to the confluence of the mainstem of the creek with the Priest River. The effects of any of the proposed alternatives would not be detectable beyond this point. As part of the larger cumulative effects analysis for the Upper West Branch drainage, the following foreseeable timber activities were assessed: Green Goose Salvage and a timber sale on Crown Pacific Timber Company land.

The alternatives that propose timber harvest would have variable amounts of treatment scattered throughout the larger Upper West Branch drainage. Should the No-Action Alternative be selected, there would be no timber harvesting, nor would many of the proposed restoration projects occur. Under Alternative A, there would be no reduction in sediment and the risk of road failure would remain high. Also under alternative A, none of the encroaching road segments in Goose, Consalus or the Squaw Valley would be removed. Under any action alternative, there would be minimal timber harvest proposed on sensitive landtypes, with a large proportion of the restoration work proposed on sensitive landtypes. Water yield changes would occur regardless of whether or not timber was harvested because most of the timber proposed for removal under any of the action alternatives is dead or dying. In sofar as a general comparison of the action alternatives, Alternative D would allow treatment of the greatest number of acres of timber land and would also permit the most watershed restoration. In order to determine the cumulative effects of the proposed alternatives along with the past and foreseeable activities associated with the drainage, project hydrologists used the WATSED model to predict changes in water and sediment yield that would occur if any of the alternatives

were implemented. Despite the varying levels of harvesting and roading in each alternative, the WATSED model suggests that there would not be any detectable difference between the No-Action Alternative and action alternatives in terms of water or sediment yield at the larger watershed scale. Furthermore, there is a weak general trend toward lower sediment yields basin wide. This trend would not be compromised under any alternative. The WATSED values were just one of the many tools used for the complete watershed effects analysis.

The WATSED model does not effectively assess the effects of the proposed watershed restoration. An alternative method was used to determine the reduction of risk should specific inventoried crossings be eliminated or improved. Based on this assessment it appears, that there would be a substantial source and risk reduction-throughout the basin under all alternatives. Within the larger Upper West Branch drainage, the amount of tons of sediment that would be reduced is estimated at over 41 tons for the action alternatives and over 29 tons for the No-Action Alternative. With some of the action alternatives up to 36 inventoried crossings and 57 uninventoried crossings would be removed. The total number of roads that would eliminated under any action alternative would range from about 20 to 36 miles. Cumulatively, there would be a substantial net improvement to watershed and water resources by virtue of reduction of the risk of sediment loading in both the short and long term at certain crossings; and through the elimination of some road segments that are encroaching on the stream or its active flood prone area.

Substantial local improvements to water quality and water resource values would be realized after all project activities are completed. Visible improvement responses would be apparent in some tributaries to the main stream. Improvement in the main stem would not be as evident, since it takes much longer for it to integrate the many diverse tributaries above it. The closure of so many miles of road would improve hillslope processes: this is especially true in the Goose and Galena drainages where much of the restoration effort is concentrated. The relocation of two sections of Road 312 would dramatically improve stream hydraulics within specific reaches of the Upper West Branch. Implementation of any action Alternative would not affect downstream wetlands, landuses or water temperature. Channel banks that have been damaged by cattle would not improve under this project. Water temperature would not be expected to change under any alternative. No harvest would occur where shade would be affected under any action alternative.

The watershed and water resource objectives of the project would be met under all action alternatives. There would be a substantial net improvement to watershed and water resources by virtue of reduction of the risk of sediment loading in both the short and long term at certain crossings; and through the elimination of some road segments that are encroaching on the stream or its active floodplain. Substantial local improvements to water quality and water resource values would be realized after all project activities are completed. No detectable changes in peak flows would occur. The recovery trend that is occurring in the main watershed would be enhanced under all alternatives, especially under the action alternatives.

Table III-179. Projected watershed response in the Upper West Branch of the Priest River Watershed, by alternative.

WATERSHED NAME: Upper West Branch of Priest River	HUC: 1701021503

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	191	191	191	191	191	191	191
Peak flow (%)	4	4	4	4	4	4	4
Net stream crossings (#)	-9	-37	-37	-37	-37	-22	-37
Net associated risk (tons/year)	-29.3	-40.2	-40.2	-40.2	-40.2	-29.7	-40.2
Net roads (miles)	-7.5	-35.4	-36.7	-35.4	-35.3	-20.2	-35.4
Net encroaching road (miles)	0	-1.4	-1.4	-1.4	-1.4	-0.8	-1.4

Direct and Indirect Tributary Scale Effects for the Upper West Branch

The direct effect of the proposed action alternatives would be a short-term increase in sediment deposition wherever stream crossings or encroaching segments are removed. On those locations where encroaching roads would be removed, the sediment delivery would remain until the exposed channel banks were revegetated (about 3 years). The direct effects of the proposed timber harvesting would be minimal given the prescribed BMPs and the implementation of the Inland Native Fish Strategy riparian protection measures. Where temporary roads are proposed to access timber, sediment could be delivered to streams for over a year until these roads were recontoured. Given that most of the proposed temporary roads are up on the ridgelines, it is highly unlikely that any sediment would reach even intermittent streams, let alone fish bearing waters. The indirect effects of increased water yield would be the same between the no action and action alternatives.

Upper West Branch Mainstem Headwaters

Cumulative Effects for the Upper West Branch Headwaters

The cumulative effects analysis of the Upper West Branch includes that portion of the Upper West Branch from the confluence of the Tola Creek upstream and including all other tributaries feeding into the mainstem of the Upper West Branch. This area was defined as the terminus of a WATSED analysis because effects were not expected to be detected beyond this point.

The WATSED model was used as a tool to predict and compare the effects of the proposed timber harvesting and road construction upon water and sediment yields. A review of the results of the WATSED model show that sediment and water yields are currently high. Sediment loads have been elevated in the past, particularly from disturbances in the erodible Kaniksu granitic geologies. The implementation of any of the action alternatives in comparison to the No-Action Alternative would not appreciably increase sediment yield and there were no predicted increases in water yield. The proposed action alternatives would treat different amounts of timber lands and would propose varying amounts of watershed restoration. Temporary roads would only be constructed under alternatives B, D and E. Timber harvesting and restoration would be maximum under Alternative D. After completion of the watershed restoration activities, some tributaries would begin to manage sediment in a more organized fashion: Over the next several years, the streambeds and banks would stabilize. There is a generally weak recovery trend taking place in the tributaries that make up the headwaters area. The trend would neither be supported or compromised under the No-Action Alternative. The trend would be enhanced under all action alternatives as a result of expansive watershed restoration. Erosion, sediment, and risks within the Headwaters area of Upper West Branch would be substantially reduced under all action alternatives due to the stabilization of

slopes affected by existing road segments. Stream temperature would not be expected to change under any alternative, since no harvest or road developments would occur where shade would be affected.

Table III-180. Projected watershed response in the Headwaters of the Upper West Branch of the Priest River Watershed (Upper West Branch Tributary), by alternative.

WATERSHED NAME: Upper West Branch of Priest River	HUC: 1701021503
TRIBUTARY: Headwaters Upper West Branch	HUC: 170102150305

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	173	174	173	174	174	173	173
Peak flow (%)	6	6	6	6	6	6	6
Net stream crossings (#)	0	-6	-6	-6	-6	-1	-6
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	+1.0	-12.1	-13.4	-12.1	-12.1	-6.7	-12.1
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Scale Effects for the Headwaters of the Upper West Branch

The direct and indirect effects of the proposed alternatives would be primarily concentrated within the Tola Creek and an unnamed drainage also located in the lowest end of the analysis area for the headwaters. drainages. Given the location of the proposed units along with the prescribed BMPs and implementation of the Inland Native Fish Strategy, there would be no direct effects to the streams with the exception of the localized sediment movement from the proposed temporary roads. The sediment generated from the temporary roads would not reach any live streams because the roads are located on ridges and on landforms that are dry and not close to streams or seeps. No increase in sediment delivered to any tributary would be expected from yarding, or from landing construction or use. Over the majority of the analysis area, there should be no effect to water resource values at risk. The net delivery of sediment following both logging and restoration would be substantially reduced in the channel. This reduction of sediment would improve channel condition and local water and habitat quality in many of the tributaries and the main channel of the the Headwaters of the Upper West Branch. One drainage where the impacts may be greater would be the Tola Creek drainage. The immediate impact of implementing any of the action alternatives would be an increase in sediment delivery to Tola from the proposed restoration and an increase in water yield from the dead and dying trees. Though the impacts to Tola from the proposed alternatives would be relatively short-lived, the channel condition would not improve until land-use practices change in the lower end of the Tola drainage. At the time of this project, those changes in land-use practices are not anticipated and they are outside the scope of this effort.

<u>Galena Creek</u>

Cumulative Effects for Galena Creek including its tributary, Solo Creek

The cumulative effects analysis area for this area is the drainage of Galena and Solo Creeks, upstream of the confluence of Galena and the Upper West Branch of the Priest River. In terms of cumulative effects for this watershed, it is most important to realize the sediment loading in these tributaries has been excessive for a long time. A review of historic harvesting and roading within the Galena/Solo Creek drainages documents a history of land-use whereby sediment and water yields have been greatly increased. The WATSED model presents a numerical value that confirms the existing high levels of water and sediment yields within the basin. Despite the intensive land-use of the past, field surveys suggest there is a strong recovery trend underway. This recovery would be enhanced by foreseeable restoration actions that are scheduled under Alternative A, and would also occur under all action alternatives. The foreseeable improvements in this drainage are the upcoming road elimination projects that will be completed in the summer of 1999 under the

old Solo Basin Timber Sale. In addition to the foreseeable activities, the action alternatives would add to that response with the elimination of a short section of encroaching road that is disrupting the local channel and inhibiting recovery. Stream temperature would not be expected to change under any alternative since no harvest or road developments would occur where shade would be affected.

Table III-181. Projected watershed response in the Upper West Branch of the Priest River Watershed (Galena Creek Tributary, including Solo Creek), by alternative.

WATERSHED NAME: Upper West Branch of Priest River	HUC: 1701021503
TRIBUTARY: Galena Creek Tributary, including Solo Creek	HUC: 170102150305

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	219	219	219	219	219	219	219
Peak flow (%)	10	10	10	10	10	10	10
Net stream crossings (#)	-9	-9	-9	-9	-9	-9	-9
Net associated risk (tons/year)	-26	-26	-26	-26	-26	-26	-26
Net roads (miles)	-8.1	-8.9	-8.9	-8.9	-8.9	-8.1	-8.9
Net encroaching road (miles)	0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

Direct and Indirect Tributary Scale Effects within Galena Creek and its tributary Solo Creek

No increase in sediment delivered to any tributary is expected from yarding, or from landing construction or use. The proposed harvest would include about 150 acres on stable lands, and would be well protected from surface water. There should be no effect to water resource values at risk as a result of logging.

Goose Creek Analysis Area

Cumulative Effects for Goose Creek

The cumulative effects analysis area for this area is the drainage of Goose Creeks, upstream of its confluence with the Upper West Branch of the Priest River. The cumulative effects analysis indicates that there have been elevated levels of sediment and water yields for a considerable time within the larger Goose Creek watershed. The WATSED model was used as a tool to compare and predict potential impacts of road construction and timber harvesting. According to the model, implementation of any of the proposed action alternatives would not differ from implementing the No-Action Alternative in terms of water and sediment yield. The amount of proposed timber harvesting would be greatest under Alternative D and yet still the model did not predict any differences in water yield between any of the proposed action alternatives and the No-Action Alternative.

The WATSED model was not used to evaluate the impacts of the proposed restoration efforts upon the water resources of Goose Creek. It was calculated that should any of the action alternatives be implemented than there would be a reduction of 20 inventoried stream crossings, almost 11 tons of sediment risk would be reduced and between 0.7 and 1.1 miles of encroaching road miles would be eliminated. For the Goose Creek drainage, the restoration effort would be the same under alternatives B, C, D and E. Alternative A and F would not provide any watershed restoration and Alternative G would provide a limited amount of restoration. The restoration proposed for the Goose and Consalus Creek drainages would provide long-term improvements to large portions of the basin. The obliteration of Road 333 in Goose Creek and the obliteration of Road 1108 in Consalus Creek would improve long-term recruitment of large woody debris, reduce delivery of sediment to the creeks, enhance stream shading and allow the streams full access to their floodplains. Both of these projects are so extensive that their cumulative effects could really improve the recovery trend for these drainages.

Marked improvements in terms of sediment movement, channel stability, water and habitat quality, and stream condition would be realized as a result of the cumulative restoration work under any alternative.

Sediment yields in the past have been and they continue to be elevated in the local streams. Peak flows increases of the past have improved to a tolerable level. Both may have a very slow recovery trend underway. Both of these characteristics would be enhanced by the restoration elements of all alternatives. The logging elements are small in scale and on low-risk landtypes. The net response of the system would be notable stabilization and reduced sediment transport over the next ten to twenty years. Habitats and water quality would improve substantially. Should any one of the action alternatives be implemented, there would be no adverse effects to water resource values at risk.

Table III-182. Projected watershed response in the Upper West Branch of the Priest River Watershed (Goose Creek Tributary), by alternative.

WATERSHED NAME: Upper West Branch of Priest River	HUC: 1701021503
TRIBUTARY: Goose Creek	HUC: 170102150303

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	283	283	283	283	282	283	283
Peak flow (%)	7	7	7	7	7	7	7
Net stream crossings (#)	0	-21	-21	-21	-21	-11	-21
Net associated risk (tons/year)	0	-10.9	-10.9	-10.9	-10.9	-0.4	-10.9
Net roads (miles)	0	-11.7	-11.7	-11.7	-11.6	-3.1	-11.7
Net encroaching road (miles)	0	-1.1	-1.1	-1.1	-1.1	-0.7	-1.1

Direct and Indirect Effects at the Tributary Scale for Goose Creek

The direct effects of the proposed actions would focus on sediment delivery. There would be no increase in sediment delivered to any tributary from logging, or from landing construction or use. There would be direct effects to sediment should any of the-action alternatives with restoration be implemented. The direct effects would be an immediate delivery of sediment to the streams that would last until the sites revegetated. However, the amount of sediment that would be delivered to the streams would be far less than that which could be delivered if the encroaching road segments and high risk crossings were left in place. Within three to five years, it is estimated that sediment will no longer be delivered to the streams from the once exposed sites. In summary, the extensive restoration efforts would result in a strong net reduction of chronic and episodic sediment loading.

Mainstem of the Upper West Branch

Cumulative Effects for Mainstem of the Upper West Branch

The cumulative effects analysis area of for this portion of the project includes the mainstem of the Upper West Branch, the south facing slopes east of Tola Creek and the area east of Goose Creek and above the confluence of the Upper West Branch and the Priest River. The WATSED model was used to predict and compare the differences of the proposed roading and timber harvesting in terms of sediment and water yields. A review of the model results and analysis of data shows that there is no difference in sediment yield between the No Action and action alternatives. There is a slight increase in water yield under Alternatives B and D but it would most likely be non-detectable in the stream. An analysis of the effects of the proposed restoration demonstrates that the associated risk of tons would be reduced by 3.3 tons, encroaching road would be reduced by 0.2 miles and there would be a net reduction of 2.3 to 2.7 miles of road. The proposed alternatives vary in the amount of proposed timber treatment, temporary road construction and watershed restoration. The proposed harvesting would be most intensive under Alternative D and least under

Alternative F. Temporary roads would be built under Alternatives B, D and E. The effect to sensitive soils would be minimal considering less than 20 acres would have any type of soil disturbance. There would not be any temporary road construction on any sensitive landtypes. The action alternatives would stimulate a recovery trend for this portion of the basin by reducing the risk of sediment delivery and by enhancing in-stream values through large- scale restoration efforts. In terms of peak flows, there are some indications from the field surveys that vegetative recovery in the basin is gradually reducing peak flows. None of the alternatives would compromise this recovery trend for water yield. Stream temperature would not change under any alternative since no harvest or road construction would occur where shade would be affected.

Table III-183. Projected watershed response in the Upper West Branch of the Priest River Watershed (Main Stem Tributary), by alternative.

WATERSHED NAME: Upper West Branch of Priest River	HUC: 1701021503
TRIBUTARY: Main stem Upper West Branch	HUC: 170102150300

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	203	203	203	203	203	203	203
Peak flow (%)	12	13	12	13	12	12	12
Net stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Net associated risk (tons/year)	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Net roads (miles)	-0.4	-2.7	-2.7	-2.7	-2.7	-2.3	-2.7
Net encroaching road (miles)	0	-0.2	-0.2	-0.2	-0.2	0	-0.2

Direct and Indirect Effects at the Tributary Scale for the Mainstem of the Upper West Branch

The majority of the proposed restoration work would occur on crossings of small first order drainages. For a short period, turbidity may be visible for several hundred feet below restoration work sites, particularly at stream crossing locations. BMPs (such as silt fences, straw barriers, and coffer structures) would be put in place during any work where the risk of delivery is likely, to minimize the escapement of most construction materials. The primary effect would be "dirty" water for a few hours following intense storms that may occur. These effects would not compromise in-stream uses or the long-term risk reductions achieved by the restoration activity itself. There would be no direct delivery of sediment to streams from the proposed timber harvesting or temporary road construction. The indirect effects of increased water yields associated with the proposed timber sale would not differ between any of the action alternatives and the No-Action Alternative.

Summation of Effects for the Upper West Branch Drainage

The Upper West Branch is not listed as a Water Quality Limited Stream. Its parent stream, Priest River, is listed from the Upper West Branch to its confluence with the Pend Oreille River, due to sediment. There would be no increase in sediment to Priest River under any alternative. Beneficial uses within the Upper West Basin include domestic water sources, recreation, agriculture and fisheries. There would not be any adverse impacts to beneficial uses.

Lower West Branch of Priest River Watershed

Cumulative Watershed Scale Effects for the Lower West Branch

For the purposes of this analysis, the Lower West Branch of the Priest River was divided into five smaller units for watershed modeling: 1) Lower West Branch headwaters, 2) North Fork Lower West Branch Tributaries, 3) Moores Creek, 4) South Facing Tributaries and 5) Main Valley of the Lower West Branch. For the cumulative effects analysis, each of these units were combined to provide for the cumulative effects

analysis for the proposed alternatives. For each of the smaller units a cumulative effects analysis will also be presented.

Cumulative Effects for the Lower West Branch at the Watershed Scale

The cumulative effects analysis area of the Lower West Branch Creek drainage includes the entire drainage from the headwaters down to the confluence of the mainstem of the creek with the Priest River. The effects of any of the proposed alternatives would not be detectable beyond this point. Reasonably foreseeable timber projects that were included in the cumulative effects analysis were the following: Snow Valley Salvage, Moore Over, Idaho Department of Lands timber sale in Pine Creek, Stimson Timber Company timber sale in Snow Creek and Crown Pacific Timber Sales in Snow Creek and Murray Creek. Scheduled road repair and improvement work would be completed in the summer of 1999 on Roads 302 and 1098.

Under any of the proposed action alternatives, there would be variable amounts of timber harvesting and watershed restoration work spread throughout the Lower West Branch. Under the No-Action Alternative, there would be no timber harvesting nor would any of the proposed restoration projects occur. Under Alternative A, there would be no reduction in sediment and the risk of road failure would remain high. The majority of the proposed timber harvesting would not occur on sensitive landtypes. The majority of the restoration efforts are concentrated in Flat Creek and Moores Creek: two drainages that are not properly functioning and which need large scale improvements to begin stabilizing the drainages. Water yield changes would occur regardless of whether or not timber was harvested because most of the timber proposed for removal under any of the action alternatives is dead or dying. A comparison of the action alternatives shows that under Alternative D, the most timber would be harvested and the most watershed restoration would occur. The WATSED model was used to predict the changes in water and sediment yield should any of the alternatives be implemented. The model results show that although the range of proposed timber treatment ranges considerably among the alternatives, there would be no increase in sediment yield or water yield between the No-Action Alternative and any of the action alternatives. Overall, within the Lower West Branch drainage, the field data suggests that while sediment yield is still a problem in some of the contributing drainages, there are other drainages where there is a general trend towards recovery in terms of water and sediment yields. The improving trends would not be compromised under any alternative.

The WATSED model was not used to assess the effects of the proposed watershed restoration. An alternative method was used to determine the reduction of risk should specific inventoried crossings be eliminated or improved. Based on this assessment it appears, that there would be a substantial source and risk reduction throughout the basin under all alternatives. Within the larger Lower West Branch drainage, the amount of tons of sediment that would be reduced is estimated at over 9 tons for most of the action alternatives and no reduction of sediment under the No-Action Alternative. The number of inventoried crossings that would be eliminated would be up to 8 on some of the action alternatives and up to 24 uninventoried crossings. The total number of roads that would eliminated under any action alternative range from almost 7 to just over 10 miles. The hydrologic recovery that is currently taking place would not be compromised, and in fact the trends would be further supported under all action alternatives due to extensive restoration efforts. All action alternatives would initiate substantial net reductions in sediment deliver to the Lower West Branch and several of its tributaries. Pronounced improved stream conditions would be achieved in some tributaries. In no case would there be any substantive net risk added.

Table III-184. Projected watershed response in the Lower West Branch of the Priest River Watershed, by alternative.

WATERSHED NAME: Lower West Branch of Priest River	HUC: 1701021502

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	295	295	295	295	295	295	295
Peak flow (%)	5	5	5	5	5	5	5
Net stream crossings (#)	0	-8	-8	-8	-8	-8	-8
Net associated risk (tons/year)	0	-9.2	-9.2	-9.2	-8.2	-7.8	-9.2
Net roads (miles)	+1.9	-9.1	-9.5	-10.3	-8.0	-6.9	-10.3
Net encroaching road (miles)	0	-0.2	-0.2	-0.2	-0.2	0	-0.2

Note: The sediment yield and peak flow change estimates in the table represent the cumulative expected responses as a result of forest management activities over time and throughout the watershed represented. The estimates assume standard BMPs and Soil and Water Conservation Practices are employed. The four "net change" lines in the table are an accounting of the driving disturbance and restoration elements in this project. When non-standard site-specific BMPs and restoration practices associated with these alternative are incorporated into the analyses, the synthesis of these analyses yields the conclusions of cumulative, direct, and indirect effects that follow.

Direct and Indirect Tributary Scale Effects for the Lower West Branch

The direct effect of the proposed action alternatives would be a short-term increase in sediment deposition wherever stream crossings or encroaching segments are removed. On those locations where roads would be removed, the sediment delivery would remain until the exposed channel banks were revegetated (about 1 year is estimated for revegetation to occur at a channel crossing). The direct effects of the proposed timber harvesting would be minimal given the prescribed BMPs and the implementation of the Inland Native Fish Strategy riparian protection measures. Where temporary roads are proposed to access timber, sediment could be delivered to streams for over a year until these roads were recontoured. Given that most of the proposed temporary roads are up on the ridgelines, it is highly unlikely that any sediment would reach even intermittent streams, let alone fish bearing waters. The indirect effects of increased water yield would be the same between the no action and action alternatives.

In the Lower West Branch, flooding is common on the meadows and wetlands of the lower watershed, an expected phenomenon on the floodplain of any stream. The damages associated with the flooding would continue only as a function of the nature and extent of developments in the floodplains. Flooding and associated damages would not be affected in any way by any of the proposed alternatives.

At the scale of this very large watershed system (over 85 square miles), no direct, indirect, or cumulative effects would be evident. Risks associated with sedimentation would be reduced in several tributaries to their benefit; but they are not likely to be measurable in the mainstem of the watershed itself. Risk reduction itself might be considered to be an indirect affect of all the action alternatives. Additional net disturbance factors would continue to accrue under the No-Action Alternative.

Lower West Branch Headwaters

Cumulative Effects for the Lower West Branch Headwaters

The cumulative effects analysis area for this portion of the project includes the following drainages: Butch, Blickensderfer, Flat, Hickman, Bearpaw, Ojibway Creeks and several unnamed drainages. This cumulative effects analysis area terminates at the confluence of the Lower West Branch mainstem and Bearpaw Creek. There would not be any effects detected beyond this point. The WATSED model was used to predict and compare the differences of the proposed roading and timber harvesting in terms of sediment and water yields. The model results show that although the range of proposed timber treatment ranges considerably between the alternatives, there would be no increase in sediment yield between the No-Action Alternative

and any of the action alternatives. Water yield increased slightly under proposed alternatives B, C and D. The amount of increase in water yield would not be detectable in the stream.

An analysis of the effects of the proposed restoration demonstrates that the associated risk of tons would be reduced by up to 2.5 tons under Alternatives B, C, D and G. Road 1142 an encroaching road would have 0.2 miles of an encroaching segment relocated. There would be a net reduction of 1.2 to 4.2 miles of road. The proposed alternatives vary in the amount of proposed timber treatment, temporary road construction and watershed restoration. The proposed harvesting would be most intensive under Alternative D and least under Alternative F. Temporary roads would be built under Alternatives B, D and E. The effect to sensitive soils would be minimal considering less than 70 acres would have any type of soil disturbance. The greatest disturbance to sensitive soils would occur under Alternative D in the Upper Flat Creek drainage. In that drainage there is a proposal to tractor harvest about 35 acres of timber that is located on moderately sensitive landtypes. BMPs and Inland Native Fish Strategy would be applied to all proposed harvest units. Still, on those proposed units with extensive sensitive soils, a site visit by a hydrologist prior to ground disturbance would address the need for more stringent protection measures. There would not be any temporary road construction on any sensitive landtypes. The hydrologic recovery trends in this portion of the Lower West Branch would not be compromised under any alternative, and they would be encouraged through extensive watershed restoration activities, especially under Alternatives D, F, and G. The most pronounced improvements in the headwater analysis area would occur in the Flat Creek and Ojibway Creek tributaries. Effects of the action alternatives would be local, without any rapid changes taking place in the main stream other than its ongoing trend toward a more stable channel and riparian complex and resorting of sediments.

Table III-185. Projected watershed response in the Lower West Branch of the Priest River Watershed (Lower West Branch Headwaters), by alternative.

WATERSHED NAME: Lower West Branch of Priest River	HUC: 1701021502
TRIBUTARY: Lower West Branch Headwaters	HUC: 170102150211 and 13

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	276	276	276	276	276	276	276
Peak flow (%)	9	10	10	10	9	9	9
Net stream crossings (#)	0	0	0	0	0	0	0
Net associated risk (tons/year)	0	-2.5	-2.5	-2.5	-1.5	-1.1	-2.5
Net roads (miles)	+0.9	-3.4	-3.4	-4.2	-2.3	-1.2	-4.2
Net encroaching road (miles)	0	-0.2	-0.2	-0.2	-0.2	0	-0.2

Note: The sediment yield and peak flow change estimates in the table represent the cumulative expected responses as a result of forest management activities over time and throughout the watershed represented. The estimates assume standard BMPs and Soil and Water Conservation Practices are employed. The four "net change" lines in the table are an accounting of the driving disturbance and restoration elements in this project. When non-standard site-specific BMPs and restoration practices

Direct and Indirect Tributary Scale Effects for the Lower West Branch Headwaters

The direct and indirect effects of the proposed alternatives would be primarily concentrated within the Flat Creek and Ojibway Creek drainages. Given the location of the proposed units along with the prescribed BMPs and implementation of the Inland Native Fish Strategy, there would be no direct effects to the streams with the exception of the localized sediment movement from the proposed construction of temporary roads. The sediment generated from the temporary roads would not reach any live streams because the roads are located on ridges and on landforms that are dry and not close to streams or seeps. No increase in sediment delivery to any tributary would be expected from yarding, or from landing construction or use. The net delivery of sediment following both logging and watershed restoration would be substantially reduced. There would be measurable improvements in sediment reductions especially in the Flat Creek drainage. The direct effect of the road eliminations would be a short term increase in sediment and a long term

improvement in channel conditions and local water and habitat quality. In addition to the road elimination planned for Flat Creek and elsewhere in the analysis area, there would also be considerable benefits from the reconstruction of almost 11 miles of existing road in the drainage. The proposed road work throughout the Headwaters of the Lower West Branch Headwaters would reduce the risk of road failure, improve hillslope processes. The majority of the streams that are associated with the restoration efforts are intermittent, though some of the restoration work is scheduled for crossings of year-round streams. Implementation of the BMPs and the Inland Native Fish Strategy would protect streams from potential impacts from proposed logging and road construction. Site specific BMPs at the time of restoration (i.e.. silt fences, mulch, etc.) would minimize increases in sediment that would result as part of the extensive restoration efforts.

North-Facing Tributaries

Cumulative Effects for the North Facing Tributaries

The cumulative effects analysis area for this portion of the Lower West Branch includes most of the north facing tributaries on the south side of Lower West Branch below the Headwaters area. The analysis area includes the following streams: Mosquito, Roger, Ole, Tunnel, Snow and Pine Creeks. All of the contributing streams generally flow in a northerly direction to the main stream.

The WATSED model was used to predict and compare the effects of the proposed timber harvesting and road construction upon water and sediment yields. A review of the results of the WATSED model show that sediment and water yields are currently high. The reason that sediment yield is so high in this area is largely attributed to past forest practices. The sediment loads still appear to be excessive, but according to field surveys a slow recovery is underway. Changes in peak flows are evident.

The implementation of any of the action alternatives in comparison to the No-Action Alternative would not appreciably increase sediment yield and there were no predicted increases in water yield. Under any of the proposed action alternatives there would be scarcely any logging planned to occur and only very minimal restoration. There would be very limited disturbance to sensitive soils from any of the action alternatives. Even under the most intensive action alternative, about 30 acres of sensitive soils would be disturbed. The majority of these acres would be located in the Ole Creek basin. Given the prescribed BMPs, no sediment would actually reach the mainstem of Ole Creek. As a result of implementing any of the action alternatives, there would be no measurable effects to either sediment or water yields. Under the No-Action Alternative, the sediment delivery in the area may be compounded due to reasonably foreseeable planned actions outside of the scope of this project. All action alternatives would result in a net reduction of risk and sediment, even with the foreseeable actions under Alternative A. No in-stream or habitat effects are likely in the short term; ongoing recovery trends would not be compromised. For all timber harvesting and restoration activities BMPs and the Inland Native Fish Strategy would be applied, thereby further reducing sediment delivery to the streams.

Table III-186. Projected watershed response in the Lower West Branch of the Priest River Watershed (North-facing Lower West Branch Tributaries), by alternative.

WATERSHED NAME: Lower West Branch of Priest River	HUC: 1701021502
TRIBUTARY: North facing Lower West Branch tributaries	HUC: 170102150202 and 04

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	246	246	246	246	246	246	246
Peak flow (%)	5	5	5	5	5	5	5
Net stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	+1.0	+0.3	+0.3	+0.3	+0.3	+0.3	+0.3
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Scale Effects for the North Facing Lower West Branch Tributaries

No increase in sediment delivery to any tributary would be expected from yarding, or from landing construction or road use. The proposed harvest would be minimal and all units would be well protected from surface water. Therefore, there should be no effect to water resource values at risk as a result of logging. Even under the most intensive action alternative, about 30 acres of sensitive soils would be disturbed. The majority of these acres would be located in the Ole Creek basin. Given the prescribed BMPs, no sediment would actually reach the mainstem of Ole Creek. The proposed watershed restoration in this area would include the elimination of road 1092L in an unnamed drainage located between Roger and South Ole creeks. The obliteration of this road only includes one live stream and it is anticipated that any sediment delivered to the stream would not adversely impact the channel.

Moores Creek Analysis Area

Cumulative Effects for Moores Creek

The cumulative effects analysis area for the Moores Creek drainage includes the entire Moores Creek drainage upstream from its confluence with the Lower West Branch. The basin has been intensively harvested, roaded and grazed. These long-term disturbances have likely exaggerated the current effects from grazing, inadequate road crossings and weak fills.

The WATSED model was used as a tool to determine the potential water and sediment yield impacts from the proposed alternatives. The model results suggest that sediment yields would increase under action Alternatives B, C, D, E and F. Water yields would increase a small amount under action Alternatives B, C, D and F. Implementation of Alternative B would have the greatest amount of ground-disturbing activities. The proposed harvesting under the maximum treatment alternative (Alternative D) would be just under 700 acres with less than 90 acres of timber treatment on sensitive landtypes. Most of the acres of proposed timber treatment on sensitive landtypes would be concentrated in the West Branch of Moores Creek drainage. The proposed construction of over 2.25 miles of temporary road would include over one half of a mile of new road on soils with a moderate to high sediment delivery potential. Given the prescribed BMPs, the amount of sediment that would reach the stream would be minimal. The temporary roads on sensitive soils are concentrated in the West Moores and Moores Headwater drainages. The roads are not in close proximity to any live streams therefore actual sediment delivery would be minimal if it occurred at all. There would be considerable watershed restoration taking place on sensitive landtypes: including the obliteration of Roads 2291F, 2291A and 1312 jeep trail to identify a few.

The Action Alternatives would eliminate or substantially reduce some of the high risk sediment sources in Moores Creek. Several miles of road that are located in the highly erodible decomposed granitics of the area would be made hydrologically inert through activities such as restoring slope stability, eliminating surface erosion, removing crossings and associated fill from the channel and its floodplain, etc.. The risks of failure from associated stream crossings would also be reduced. This would lead toward more rapid channel stability; but at this scale, the main stream would improve very slowly. There appears to be a sustained reduction in any peak flow increases underway, and no alternative would effectively change that rate.

Table III-187. Projected watershed response in the Lower West Branch of the Priest River Watershed (Moores Creek Tributary), by alternative.

WATERSHED NAME: Lower West Branch of Priest River	HUC: 1701021502
TRIBUTARY: Moores Creek	HUC: 170102150215

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	380	385	380	385	381	385	380
Peak flow (%)	10	11	11	11	10	11	10
Net stream crossings (#)	0	-6	-6	-6	-6	-6	-6
Net associated risk (tons/year)	0	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
Net roads (miles)	0	-4.3	-4.7	-4.3	-4.3	-4.3	-4.3
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Scale Effects for Moores Creek

There would be no direct effects from sediment delivery from the proposed logging activities and temporary road construction. The indirect effects of increased water yield attributed to the removal of vegetation would not differ between the No-Action Alternative and any of the action alternatives. The indirect effect of the temporary road construction would be a short-term change in slope processes because of an increase in soil compaction and concentration of overland flow. The temporary roads would be recontoured within a year of construction and therefore the effects would be short-term and would not affect resource values in the longterm.

The most intensive harvesting in Moores Creek would be in the West Moores Creek drainage. Within this tributary, there would be the most intensive logging and the most intensive restoration. The existing condition of West Moores is poor and the implementation of the restoration proposed in the action alternatives would provide measurable improvements to the stream (i.e. reduced sediment delivery, improved width to depth ratios, fewer failed crossings, more stable roads). Under the most intensive action alternative, about 35 acres of sensitive soils would be disturbed. The majority of these acres would be located in the West Moores Creek basin. Given the prescribed BMPs, no sediment would actually reach the mainstem of Moores Creek. The proposed watershed restoration in this area would include the elimination of several roads that cross live streams (i.e. Roads 2291a, 2250a, 1042a, 1312 jeep trail). It is anticipated that any sediment delivered to the stream from the removal of stream crossings would be minimized by the application of site specific BMPs (i.e. mulching, rapid revegetation of disturbed soils). The increased delivery of sediment would be concentrated in the West Moores Creek drainage, the amount of sediment would be minimal and would not adversely impact the channel.

South-Facing Tributaries

Cumulative Effects for the South-Facing Tributaries

The cumulative effects analysis area for this portion of the Lower West Branch includes a portion of the south side of the Lower West Branch drainage. The contributing tributaries include Pee Wee, Kavanaugh

and Guinn Creeks. All of the contributing streams generally flow in a southerly direction to the main stream.

The WATSED model was used to predict and compare the effects of the proposed timber harvesting and road construction upon water and sediment yields. A review of the results of the WATSED model shows that sediment yields are not very elevated in this portion of the larger Lower West Branch drainage, though water yields are elevated. Water yields may be high in the drainage because older harvest units have not recovered hydrologically. Sediment loading has been and continues to be occurring locally in the tributary streams. A field review determined that the tributary streams are not delivering large volumes of bedload to the mainstem of the Lower West Branch. Overall, the watershed is stabilizing. This trend would not change as a result of any alternative. Water yield may be high within the analysis area because the openings created from past timber harvesting have not yet recovered hydrologically. Gradually these peak flows appear to be recovering as vegetation becomes re-established. The trend would continue, perhaps with a one to three-year delay (because of project related work), but this response would have no effect on the stream or water resources.

Table III-188. Projected watershed response in the Lower West Branch of the Priest River Watershed (South-facing Lower West Branch Tributaries), by alternative.

WATERSHED NAME: Lower West Branch of Priest River	HUC: 1701021502
TRIBUTARY: South-facing Lower West Branch tributaries	HUC: 170102150200

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	109	109	109	109	109	109	109
Peak flow (%)	7	7	7	7	7	7	7
Net stream crossings (#)	0	0	0	0	0	0	0
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	0	0	0	0	0	0	0
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Scale Effects for the South Facing Lower West Branch Tributaries

The proposed timber harvesting would be concentrated in the Pee Wee and Kavanaugh Creek drainages. The proposed harvesting in Pee Wee Creek would all be helicopter logging and there would be no direct effects to sediment yield. In Kavanaugh Creek, there would be a blend of harvest methods and approximately 13 acres of sensitive soils would have ground-disturbing activities. Given the prescribed BMPs and the implementation of the Inland Native Fish Strategy, there should not be any direct delivery of sediment to any stream from the proposed logging. No temporary roads would be constructed, nor would any existing roads be eliminated under any action alternative. There would be some road reconstruction of Roads 1314 and 1314f associated with the implementation of the action alternatives. The implementation of any of the action alternatives would not affect the existing sediment loading in the tributaries. These tributaries would continue to have elevated sediment loading that would continue to fill inchannel pools and cause channel adjustment.

Main Valley of the Lower West Branch

Cumulative Effects for the Main Valley of the Lower West Branch

The cumulative effects analysis area for this portion of the Lower West Branch includes the main valley of the Lower West Branch drainage. This area includes the tributaries on both sides of the stream that flow mainly into the wide meadow complexes at the lower end of the watershed.

The WATSED model was used to predict the possible impacts of implementing any of the alternatives upon water and sediment yield. Again both sediment and peak flows have been and continue to be elevated. There appears to be a general trend toward a reduction of sediment input and a distinct trend toward further reduction of the peak flow changes. All action alternatives would further support these trends, perhaps with a one or two-year delay from logging activities. However, the restoration elements would reduce sediment risks and sources in both the short and long-term.

Instream improvements would be demonstrated by the stabilization of tributary channels, less movement and drifting of sands, and a slowing of bar formation. Since the mainstem of Lower West Branch below these tributaries is defined by local land use and the integration of the entire watershed, the improvements in the tributaries would not be evident in the main stream, except perhaps to a reduction in episodic sediment-loading events.

The proposed action alternatives did not vary tremendously between the amount of timber that would be treated nor the amount of watershed restoration to be implemented. There would be slightly more watershed restoration work completed under Alternatives D and G than in the other action alternatives. (The 1314 roads would only be eliminated in Alternatives D and G). The proposed restoration work would reduce the risk of future road failure and would improve hillslope processes. Throughout the analysis area, the proposed timber harvesting would be light and would in most cases remove less than 20% of the existing canopy. There would not be any logging associated ground disturbance of sensitive soils under any alternative. The results of the model support the analysis of the project, in that there would be no change from the existing water and sediment yields should any of the action alternatives be implemented. For any action alternative BMPs would be implemented and there would be strict adherence to the Inland Native Fish Strategy.

Table III-189. Projected watershed response in the Lower West Branch of the Priest River Watershed (Main Valley Tributary of the Lower West Branch), by alternative.

WATERSHED NAME: Lower West Branch of Priest River	HUC: 1701021502
TRIBUTARY: Main Valley of Lower West Branch	HUC: 170102150200

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	229	229	229	229	226	229	229
Peak flow (%)	7	7	7	7	7	7	7
Net stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Net associated risk (tons/year)	0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Net roads (miles)	0	-1.7	-1.7	-2.1	-1.7	-1.7	-2.1
Net encroaching road (miles)	0	0	0	0	0	0	0

Direct and Indirect Tributary Scale Effects for the Main Valley of the Lower West Branch

Given the prescribed BMPs and the implementation of the Inland Native Fish Strategy, there should not be any direct delivery of sediment to any stream from the proposed logging. The obliteration of roads such as 1092l and 1335c would cause short-term increase in sediment delivery where the live stream crossings were removed. A portion of road 1092l that would be removed is located on highly sensitive soils. In addition to road elimination, the action alternatives would reconstruct portions of several roads including , but not limited to Roads 1335, 53 and 2232. The road reconstruction would improve existing conditions by improving road drainage, reducing the delivery of fines off of the roads to the streams and dispersing the runoff generated from the road prism. A portion of the reconstruction proposed for Road 2232 would occur on soils with a moderate risk for sediment delivery to the creek. Site specific BMPs (i.e.. silt fences, mulch and coffer dams) would minimize the amount of sediment that would be delivered at the stream crossings from the proposed road elimination and/or restoration.

Summation for the Lower West Branch

The portion of the Lower West Branch located in Idaho (the lower reaches) is listed as Water Quality Limited Stream segments because of unknown pollutants. It flows into the lower Priest River, which is also listed as a Water Quality Limited Stream from the confluence with Upper West Branch to its mouth at the Pend Oreille River. Priest River itself is listed as a Water Quality Limited Stream, due to sediment. Assuming the sediment is one of the pollutants that should be considered as the reason Lower West Branch has been listed, No-Action Alternatives would create any additional net sediment in the watershed or its tributaries or delivered to Priest River itself.

Quartz Analysis Area

Cumulative Watershed Scale Effects for Quartz Creek

The cumulative effects analysis area of Quartz Creek is the drainage upstream of the confluence with the Priest River. The effects of the proposed alternatives would not be detectable beyond this point. The cumulative effects of the proposed action alternatives on the water resources of Quartz Creek are presented below.

The WATSED model was used as a tool to evaluate the impacts of the proposed timber harvesting and road construction upon water and sediment yields. A slow recovery trend is underway and would not be compromised under any alternative. Restoration activities would enhance the ability for the stream system to improve. The proposed timber harvesting and temporary road construction varies among the action alternatives. The most intensive action alternative (Alternative D) proposes treatment on approximately 550 acres and construction of approximately 0.7 miles of temporary road. With the implementation of any of the action alternatives (except Alternative G), over 40 acres of sensitive soils would be disturbed in the lower most subdrainage of Quartz Creek. A review of the area of concern shows that no live streams are present and therefore there should not be any delivery of sediment to any streamcourse as a result of the action alternatives. All action alternatives would include relocation of the 416 Road that is currently encroaching on the mainstem of Quartz Creek. There would be very limited watershed restoration projects guaranteed within the Quartz Creek drainage. Some of the other guaranteed projects would include applying erosion control mats on disturbed soils along Roads 416 and 334, as well as reconstruction of Road 1335.

A thorough analysis of the data and stream surveys suggests that there has been severely elevated sediment loading and some peak flow increases from past disturbances in the watershed. The high sediment yields are largely attributed to the network of roads on the easily disturbed and easily eroded ancient lake deposits located in the lower reaches of the Quartz Creek basin. Sediment yields have been elevated by past management, resulting in excess deposition and reworking of sediment in many reaches of the watershed. In recent years, efforts have been made to control the input of sediment off of existing roads by heavily rocking road surfaces, increasing the amount of relief pipes in the ditchlines and applying erosion control mats on disturbed slopes near stream crossings. District monitoring shows that all of these techniques have worked well in Quartz Creek and under each of the action alternatives, similar projects would be accomplished. The most extensive single restoration effort that would take place under the action alternatives would be the relocation of 0.6 miles of road that is in the riparian zone for the mainstem of Quartz Creek. Removing this road would reduce the encroaching road in the basin by 0.3 miles and would allow the stream to access its floodplain. It also would encourage the long-term recruitment of large woody debris to the stream. Within five years, there would be a measurable improvement in channel morphology and ultimately fish habitat.

In summary, the water resource objectives of the project would be met under all action alternatives. There would be a net improvement to watershed and water resources by virtue of reduction of the risk of sediment loading in both the short and long term at certain crossings; and through the elimination of some road segments that are currently encroaching on the stream and its active floodplain. Substantial local

improvements to water quality and water resource values would be realized after all project activities are completed. No detectable changes in peak flows would occur. Stream temperature would not be expected to change under any alternative, since no harvest or road developments would occur where shade would be affected.

Table III-190. Projected watershed response in the Quartz Creek Watershed, by alternative.

WATERSHED NAME: Quartz Creek	HUC: 170102150105

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	262	263	262	263	262	263	262
Peak flow (%)	6	6	6	6	6	6	6
Net stream crossings (#)	0	0	0	0	0	0	0
Net associated risk (tons/year)	0	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Net roads (miles)	0	0	0	0	0	0	0
Net encroaching road (miles)	0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3

Direct and Indirect Tributary Scale Effects for Quartz Creek

The most responsive stream condition improvements would be local, in the tributary and stream reaches immediately adjacent to and downstream of the restoration activities.

In that portion of the Quartz where Road 416 removal would occur, there would be an increase in sediment yield for a period of 1 to 5 years or until the newly planted vegetation becomes established on the exposed soils. The recovery time would depend upon future climate patterns that could either enhance or delay recovery. The sediment that would be delivered to the mainstem of Quartz Creek would cause some pool filling and lateral deposits for the season after disturbance. Once the site was revegetated then the source of sediment would cease and the in-stream sediment would be resorted and gradually moved down through the channel where it would deposit behind obstructions.

Summation for Quartz Creek

Quartz Creek is not listed as a Water Quality Limited Stream. Quartz Creek is a tributary to the Priest River, which is listed as a Water Quality Limited Stream from the Upper West Branch to its confluence at the Pend Oreille River. There would be no increase in sediment to Priest River under any of the proposed alternatives. The Quartz Creek watershed is considered to be functioning at risk, with some adverse disturbances that are inhibiting its full recovery

Priest River Face Analysis Area

Cumulative Effects for the Priest River Face

The cumulative effects analysis for this portion of the project includes the land immediately adjacent to the Priest River and all of the small tributaries that flow into Priest River from the confluence of Lamb Creek and the Priest River, downstream to where Cottonwood Creek joins the Priest River. The watersheds in this analysis area are generally small, only flow seasonally, and drain directly into the Priest River. Implementation of any alternative would not impair water quality, alter stream condition, or measurably increase the magnitude or quantity of flows in Priest River.

The WATSED model was used as a tool to predict any potential increases in sediment or water yield that would result if any alternative were implemented. A review of the model results show that there would be no change in water or sediment yield between any of the action alternatives and the No-Action Alternative. Alternative D would have the most proposed timber harvesting and would treat under 300 acres. The amount of ground disturbance that would occur on sensitive soils is very small (just over five acres) and would not affect resource values. There are no streams associated with this piece of sensitive soils and therefore there would not be any delivery of sediment to the streams. There would be no construction of temporary roads. Reconstruction of an existing system road would reduce the current delivery of sediment at stream crossings. There are no watershed improvement projects guaranteed to occur in this portion of the project area. Cumulatively, implementation of the any of the alternatives would not have measurable impacts to the streams or other water resources.

Table III-191. Projected watershed response in the Priest River Face Watershed, by alternative.

WATERSHED NAME: Priest River Face Area — HUC: 1701021501

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Sediment yield (%)	180	180	180	180	180	180	180
Peak flow (%)	8	8	8	8	8	8	8
Net stream crossings (#)	0	0	0	0	0	0	0
Net associated risk (tons/year)	0	0	0	0	0	0	0
Net roads (miles)	0	0	0	0	0	0	0
Net encroaching road (miles)	0	0	0	0	0	0	0

Note: The sediment yield and peak flow change estimates in the table represent the cumulative expected responses as a result of forest management activities over time and throughout the watershed represented. The estimates assume standard BMPs and Soil and Water Conservation Practices are employed. The four "net change" lines in the table are an accounting of the driving disturbance and restoration elements in this project. When non-standard site-specific BMPs and restoration practices associated with these alternative are incorporated into the analyses, the synthesis of these analyses yields the conclusions of cumulative, direct, and indirect effects that follow.

Direct and Indirect Tributary Scale Effects for the Priest River Face

The proposed units were located and designed to minimize any direct impacts to streams or water resources. The implementation of BMPs and adherence to the Inland Native Fish Strategy would reduce the risk of any direct impacts to streams. The reconstruction of Road 1300F would reduce current sediment delivery at two stream crossings. Indirect effects from increased water yield would not differ between the No-Action and action alternatives since mostly dead and dying trees would be removed. Stream temperature is not expected to change under any alternative, since no harvest or road construction would occur where shade would be affected. No atypical effects at the localized or site-scale level were identified during the analysis.

Summation for Priest River Face

Streams within this watershed area are not listed as Water Quality Limited; however, they drain directly into a reach of Priest River that is listed as a Water Quality Limited Stream segment. -In summary, whileno alternative would contribute to the pollutant that caused the river to be listed, no alternative would alleviate the situation either.

Cumulative Effects at the Priest Lake Project Area Scale

Overview

The project area is widely distributed over the Priest River sub-basin. All alternatives provide watershed restoration improvements in local watersheds. Substantial improvements would be realized in the action alternatives, especially alternatives B, C, D, E, and G. However due to the wide and dispersed nature of the improvements, from the overall perspective of the project area, the cumulative effects of all the improvements would remain evident only within the local watersheds.

Local water quality will be enhanced; but no measurable response would be recognizable in the large rivers or the lake. Similarly, there would be no direct or indirect effects at this scale.

Table III-192. Watershed Summary for the Priest River Project Area, by alternative.

WATERSHED NAME: Priest River							HUC: 17010215
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Net stream crossings (#)	-9	-52	-52	-52	-52	-37	-52
Net associated risk (tons/year)	-29.3	-60.5	-60.5	-60.5	-59.5	-59.1	-60.5
Net roads (miles)	-3.8	-56.8	-58.5	-58.0	-55.6	-37.9	-58.0
Net encroaching road (miles)	0.1	-1.9	-1.9	-1.9	-1.9	-1.3	-1.9

Effects of Opportunities

Timber Stand Improvement

If timber stand improvement opportunities are implemented, no consequential effects would occur to hillslope processes; timing, magnitude, or quantity of flows; or stream channel processes.

Noxious Weeds

If noxious weed control opportunities are implemented, no consequential effects would occur to hillslope processes; timing, magnitude, or quantity of flows; or stream channel processes.

Watershed and Wildlife Restoration

Direct Effects

Hillslope Processes: Road decommissioning would decrease compaction and increase productivity. The removal or upgrade of culverts would input sediment directly into streams. In larger streams the sediment would not be measurable in comparison to natural sediment transport rates. In smaller channels, localized deposition of fine sediment would occur until streams have the energy to redistribute the sediment down stream (such as annual spring runoff).

Timing, Magnitude, and Quantity of Flows: Decommissioned roads would be treated to eliminate the increase of flow contribution from roads to streams. A reduction in the quantity and timing of peak flows would be expected in headwater basins. Some measurable decrease would be expected within larger stream systems.

Stream Channel Processes: Some changes would occur to stream channel processes. Some road segments would be removed that are encroaching on the flood-plain, This would trend affected floodplains towards natural function during flood events, and reduce the risk of road failure at these locations.

Indirect Effects

Hillslope Processes: Road decommissioning would improve the stability of some road segments. All road segments decommissioned would have fills removed where mass failure is likely. Indirect sediment input to streams would increase under all action alternatives while activities are implemented. In larger streams the sediment would not be measurable in comparison to natural sediment transport rates. In smaller channels, localized deposition of fine sediment would occur until streams have the energy to redistribute the sediment down stream (such as annual spring runoff). Stream crossings that are removed would reduce long term sediment delivery risk by removing fills from stream channels. Stream channels and habitats locally and downstream of project areas would be subject to substantially less risk of sedimentation and channel failure.

Timing, Magnitude, and Quantity of Flows: No measurable effect would occur to perennial streams. Harvest of live trees is unlikely to change flows during rain-on-snow events.

Stream Channel Processes: Stream channels and habitats locally and downstream of restoration areas would be subject to substantially less risk of sedimentation and channel failure. Local trends of improvement of stream condition would be established rapidly. Reduction in the risk of road and stream crossing failure would reduce the occurrence of mass input of sediment into channels during large climatic events such as the rain-on-snow events that occurred in area during 1995 and 1996.

Cumulative Effects

Hillslope Processes: No cumulative effects would be expected to alter hillslope function.

Timing, Magnitude, and Quantity of Flows: The cumulative effects of implementing watershed and wildlife restoration projects may decrease the quantity and timing of peak flows in some stream systems.

Stream Channel Processes: Stream channel conditions would improve if watershed and wildlife opportunities are implemented.

Water Quality: Short-term increases in sediment would occur in localized areas. Some improvement to water quality would occur downstream of improvement projects.

Consistency With the Forest Plan and Other Applicable Regulatory Direction

Protect water quality per the Clean Water Act and to meet or exceed States' Water Quality Standards: The Forest Service has agreements with the States to implement Best Management Practices (BMP) or Soil and Water Conservation Practices for all management activities to meet the objectives for Forest Practices . Monitoring would be designed to demonstrate the implementation of BMPs and provide feedback concerning their effectiveness in protecting water quality. Watershed conditions that contribute to water quality that is impaired would be improved through restoration projects and through scheduling of timber harvest and road building activities.

Riparian areas would be managed to meet objectives for riparian-dependent resources (fish and wildlife habitats, water quality, stream channel integrity, vegetation, public water supplies).

Inland Native Fish Strategy: The Inland Native Fish Strategy has been implemented as amendments to the Forest Plans of the Idaho Panhandle and Colville National Forests. All action alternatives would be consistent with this direction. The amendments require mitigation of environmental effects of management decisions. Specified riparian management goals and objectives have been developed, and Riparian Habitat Conservation Areas (RHCA) are defined and delineated. Riparian management and Riparian Management Objectives (RMO) are addressed using site-specific analysis and supportive data, and watershed analyses. The strategy also specifies standards and guidelines which must be applied for certain activities in RHCAs. These are incorporated into the action alternatives as specified in Chapter II.

Clean Water Act and Water Quality Limited §303(d) Listings

Under authority of the Clean Water Act, the EPA and the States must develop plans and objectives (TMDLs) that will eventually restore listed stream segments. In lieu of those plans, Forest Service will demonstrate or find that their actions will not result in a net substantial increase in the pollutant of concern or prohibit or delay potential recovery (IDHW, 1997; USFS, 1995).

Alternatives A, B, C and E would be consistent with the Clean Water Act and Water Quality Limited Listings.

Alternatives D and F, as designed, would not be consistent or would be marginally consistent with the Clean Water Act and Water Quality Limited Listings in Bumblebee Area and Steamboat Creek.

SOIL PRODUCTIVITY

CHANGES BETWEEN THE DRAFT AND FINAL EIS

Due to public comments and additional analysis that was completed, a section was added for Soil Productivity that was not written for the Draft EIS.

REGULATORY FRAMEWORK

The regulatory framework providing direction for protecting a site's inherent capacity to grow vegetation comes from the following principle sources:

- *The Multiple Use-Sustained Yield Act of 1960,*
- *The National Forest Management Act of 1976 (NFMA),*
- *The Code of Federal Regulations for Forest Planning (36, CFR 200.1),*
- *The Forest Plan and Regional Soil Quality Standards (FSH 2509.18)*

The Multiple Use-Sustained Yield Act of 1960 directs the Forest Service to achieve and maintain outputs of various renewable resources in perpetuity without permanent impairment of the land's productivity.

Section 6 of the National Forest Management Act of 1976 (NFMA) charges the Secretary of Agriculture with ensuring research and continuous monitoring of each management system to safeguard the land's productivity.

The Code of Federal Regulations for Forest Planning that followed NFMA requires the Forest Service to measure effects of prescriptions, including "significant changes in land productivity" (Code of Federal Regulations 36, CFR Part 200, Section 1, 1987).

To comply with NFMA, the Chief of the Forest Service has charged each Forest Service Region with developing soil quality standards for detecting soil disturbances indicating a loss in long-term productive potential. These standards and guidelines are built into Forest Plans.

AFFECTED ENVIRONMENT

Soil productivity is the output of a specified plant or group of plants under a defined set of management practices, or total plant mass produced annually per unit area.

The most productive part of the project area's soils occurs near the surface at the contact between the forest litter and the mineral soil. Here the litter has been highly decomposed into dark colored amorphous material which is the richest and most productive part of the soil. This layer is frequently only a few inches thick but its presence is much more important than its thickness would indicate. This organic matter rich layer contains most of the soil nitrogen, potassium and mycorrhizae which must be present for a site to be productive.

Below this organic horizon is volcanic ash which occurs as the surface layer of the mineral soil. In north Idaho, the ash layer is typically 16 inches thick, ranging between 7 and 24 inches on most sites. The top part of the ash is usually enriched in organic matter which also contributes nitrogen, potassium and mycorrhizae to this part of the soil. The lower part of the volcanic ash has less organic matter and is not as fertile as the

upper part. The ash has a high water holding capacity and nutrient holding capacity both of which are important for soil productivity.

Below the volcanic ash, the subsoils and substratum tend to be coarse textured in the granitic soils and medium textured in the Belt, metasedimentary soils. These subsoil and substratum materials are very weakly weathered. They tend to have a high component of rock fragments, although, this can be quite variable, particularly in the alluvial bottoms and outwash materials. The lacustrine or lakebed soils have subsoil and substratum materials that are fine textured, with few rock fragments.

Most of the productivity of all project area soils is found near the soil surface. This is also the part of the soil that is easiest to disturb by management activities. The soils of this project area are generally rated low to moderate in productivity potential.

A more detailed description of the geomorphology, soils, erosion processes and soil productivity can be found in the draft soil map unit descriptions and a soil characterization for the Priest basin. These documents are included in the project file.

The Priest Lake Project Area has proposed harvest units which range from 158 proposed units in Alternative F to 314 proposed units in Alternative D. The following existing conditions occur within some of the proposed project area: 43 units (466 acres) were tractor logged and 10 units (30 acres) were cable logged; the remaining units did not have any apparent harvest activity, but about half of these unlogged units have roads through or adjacent to the unit.

Eighteen of the existing tractor logged units (381 acres), presently being proposed for additional harvest activity have detrimentally disturbed soils that may exceed compaction and displacement soil quality standard by 1 to 46 percent; an additional 10 tractor logged units (227 acres) are marginal (within five percent of exceeding standards), totaling 116 acres. The remaining tractor logged units had detrimentally disturbed soils that ranged from 6 to 13 percent. Data for all of the above units are in spreadsheets which are in the soils portion of the project files.

Four other units (57 acres) have detrimentally disturbed soils that may not meet Forest Plan soil quality standards, an additional seven units (41 acres) are marginal; the disturbance in these units are a result of extensive roading.

In summary, twenty-two units (438 acres) which were harvested prior to the development of the 1987 Forest Plan, presently may not meet Forest Plan soil quality standards and seventeen units (268 acres) are marginal. 173 of 314 proposed harvest units (3,519 acres) occur on low potassium soils.

ENVIRONMENTAL CONSEQUENCES

Methodology

In order to demonstrate that the Forest Plan standard would be achieved with the alternative as proposed; and to identify specific proposed units that would require design modifications or site specific practices to achieve the standard; a systematic procedure was established to identify the existing condition of each proposed unit in terms of the detrimentally disturbed soils standard, low potassium and those units that are at risk of not meeting the standard.

A spreadsheet was developed which lists all proposed treatment units in each alternative; the existing condition for those units, include acres of constructed or designated trails, roads (permanent or temporary) within or adjacent; landings within or adjacent; logging, slashing, yarding systems and areas of severe burning. These activities were compiled in this spreadsheet from aerial photos and from timber stand and

road data bases. The spreadsheet was designed to calculate the detrimentally disturbed area of each activity area. The coefficients for these calculations came from Forest soil monitoring data. Monitoring data exists for each type of harvest and slash disposal systems represented on the proposed project units that have had harvest and slash treatment activities. The average percentage of detrimentally disturbed soils obtained from transects of past monitoring for the appropriate harvest or slash treatment were applied to existing units.

This monitoring information is contained in the Forest Plan Monitoring and Evaluation Reports (1988 through 1993 and 1997) which are on file in the Forest Supervisor's Office of the Idaho Panhandle National Forests.

A second spreadsheet contains all the proposed actions by alternative. These actions were compared to the existing condition and the mitigation measures common to all action alternatives to evaluate where each unit roughly stands in relation to the Forest Plan standards. Units that may exceed or nearly exceed (marginal) standards would follow specific soil mitigation measures common to all alternatives listed in chapter II.

To determine potassium limited sites, a map of proposed project units was overlaid on a map of geologic formations to determine which units occurred on the Prichard and St. Regis geologic formations.

All spreadsheets can be found in the soils productivity section of the project file.

The following three design and management criteria relate to soil productivity in the Douglas-fir Beetle Project:

1. Detrimentally disturbed soils within activity areas (harvest units).

All action alternatives would comply with Forest Plan Standards and Regional Soil Quality Standards (FSH 2509.18) related to detrimentally disturbed soils.

Compliance with these standards requires that at least 80 percent of an activity area (harvest unit and any adjacent roads or landings) must be in a condition of acceptable productivity for trees and other managed vegetation, that is, no more than 20 percent of an activity area may have detrimentally disturbed soils. This standard is based on the lowest magnitude of adverse change detectable, given current monitoring technology (Powers et al. 1990).

The soils in an activity area are considered detrimentally disturbed when the following soil conditions exist as a result of Forest practices:

A. Soil displacement results in the loss of either 1 inch of or half of the humus-enriched surface layer (A-soil horizon), whichever is less. The loss of the litter layer alone could be detrimental on some marginal sites. Displacement removes the most productive part of the soil resource. Roading, ground-based yarding, dozer piling and cable corridors are the major contributors to displacement.

B. Soil compaction results in a 20 percent or more increase in bulk density, or a 50 percent reduction in water infiltration rates typical for volcanic ash influenced surface soils. Soil compaction reduces the supply of air, water and nutrients to plants. Roading, ground based yarding and piling are the major contributors to compaction.

C. Fire consumes most woody debris and the entire duff and litter layer, exposing mineral soil. Burn ashes is white or reddish color, indicating that much of the carbon was oxidized by fire (Burned-Area Emergency Rehabilitation Handbook FSH 2509.13). Burns which create very high temperatures at the soil surface when surface soil moisture content is low results in almost complete loss of surface and upper soil horizon organics. Many of the nutrients stored in these organics can be lost to the atmosphere through volatilization and removed from the site in fly-ash (Garrison and Moore, 1998).

2. Low Potassium Sites - Sites containing geologic formations that are naturally deficient in potassium bearing minerals.

This criteria relates to the natural deficiency of potassium (K) in the Prichard and St. Regis geologic formations. The Prichard and St. Regis geologic formations contain only traces of potassium feldspars. The other geologic formations that occur as part of the Belt Metasedimentary rocks have percentages of potassium feldspar within their mineral composition, that range from 2 to 12 percent (Harrison and Campbell, 1963). The majority of the beetle project area consists of Belt Metasedimentary geology. Unlike many other soil nutrients, potassium is derived almost entirely from the underlying rock formations. On some sites 45 percent of the potassium is held in trees, with the remainder being held in subordinate vegetation, forest floor and soil pools. Within the trees, about 85 percent of the potassium is held in the branches, twigs and foliage (Garrison and Moore, 1998). In most natural circumstances the potassium returns to the soil when the tree dies. If potassium is removed from the site, the loss is long-term. Whole tree yarding and removal of tree tops leads to the direct loss of potassium (Morris and Miller, 1994).

Some very preliminary research being done by the Intermountain Forest Tree Nutrition Cooperative (IFTNC) is showing a possible link to potassium deficiency and the lack of tree resistance to root rot. Most of the root rot concentrations within this beetle project area appear to be on the low potassium sites, this has not been tested, it is only an observation.

First year results from the seedling establishment/nutrition experiment conducted by the Intermountain Forest Tree Nutrition Cooperative showed that potassium was non-limiting from a tree growth standpoint on the Flat Creek Belt Metasedimentary site, (Garrison, 1998). This Belt Metasedimentary site is on the Striped Peak formation, and according to Harrison and Campbell contains about seven percent potassium feldspar in its mineral composition.

The Intermountain Forest Tree Nutrition Cooperative is continuing to research potassium contents within tree species and different rock types in order to establish more definite minimum thresholds and affects on tree growth and resistance to root diseases. Until these minimum thresholds are developed through research, the Idaho Panhandle National Forest is using management recommendations from the IFTNC as a guideline for maintaining sufficient potassium on a site. The Forest is also planning to do tree foliar analysis in cooperation with the Tree Nutrition Cooperative this fall, in order to gather more information on forest potassium levels, if funding can be obtained.

The IFTNC has made the following management recommendations to retain the maximum possible amount of potassium on site after logging:

A. *Practice conventional removal (lop and scatter) rather than whole tree removal. The "lop and scatter" technique should be practiced during intermediate as well as final harvest operations.*
B. *Let slash remain on site over winter so mobile nutrients such as potassium can leach from fine materials back to the soil.*
C. *Light broadcast burn or underburn for release of potassium and other nutrients.*
D. *Avoid mechanical site preparation.*
E. *Plant species appropriate to site.*

In this project, we would use the recommendations of the IFTNC in the evaluation of alternatives.

3. Maintenance of large woody debris and organic matter.

The third soil productivity criteria common to all action alternatives relates to the management of coarse woody debris and organic matter which would follow the research guidelines contained in Graham et al., 1994. The optimum level of fine organic matter is 21 to 30 percent and this equates to 1 to 2 inches of surface litter and humus. Optimum levels of fine organic matter relate to ectomycorrhizae fungus which form a strong and positive relationship. Ectomycorrhizae is a good indicator of a healthy forest soil. In moist western hemlock and cedar habitat types strong levels of ectomycorrhizae exists when organic levels exceed 30 percent. Soil survey data indicates that most forest sites have adequate organic matter levels to support strong ectomycorrhizae populations.

This soil productivity criteria is addressed as a mitigation requirement only and is not part of the alternative evaluations, because project alternatives are designed to meet the large woody debris guidelines.

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

Direct and Indirect Effects

Soil productivity would not be compromised beyond Forest Plan soil quality standards for any alternative through the application of soil management requirements listed and described in chapter II.

Direct, indirect and cumulative impacts related to the alternatives of this project on soil productivity are typically at the site scale. Cumulative effects at a site are a function of past harvest methods and proposed harvest methods.

Detrimental soil disturbances such as compaction, displacement and possibly severe burning would increase on all action alternatives, except possibly Alternative G. Road building and tractor harvest units where additional designated skid trails are planned would receive the greatest amount of soil disturbance. Minor disturbances would occur on skyline and cable units and where fireline is constructed around units. Compaction, displacement and severe burning affect soil physical, chemical and biological properties which indirectly can affect the growth and health of trees and other plants.

On all action alternatives, harvesting trees and leaving the slash on site would remove the least amount of potassium and other essential nutrients off site. On the contrary, harvesting trees with the tops attached would remove the most. The significance of the potassium removal in relation to site productivity increases when harvest activities occur on low potassium sites, but measuring the effects on site productivity due to the loss of potassium cannot be predicted with certainty until more research information becomes available.

A positive affect occurs when the foliage and branches of harvested Douglas-fir trees are allowed to recycle on site, thereby, releasing stored nutrients, such as potassium and nitrogen back to the soil. Douglas-fir consumes and stores more potassium than most other trees. The release and availability of this stored potassium would benefit larch and western white pine, which require less potassium for growth and maintenance (Garrison and Moore, 1998). These more potassium efficient trees would be planted in all regeneration harvest units and favored within the improvement harvest units.

Effects of Alternative A (No Action)

A direct affect of bark beetle infestation is acceleration of tree mortality, increasing down organic matter and fuel loadings. In moist habitat sites, which make up approximately 85 percent of this project area, this increase in organic matter is a benefit to soil productivity. This response would be much less or could be a negative in dry habitat types which make up approximately 15 percent of this project area. Increased fuel

loadings, would increase the risk of soil damage (loss of organics, loss of nutrients, reduction of infiltration; this would substantially reduce the productivity of the site) in the event of high severity fires.

The twenty-two proposed units that presently have existing conditions that may not meet soil quality standards for detrimentally disturbed soils would remain adversely disturbed.

Increased fuel loadings on low potassium sites would increase the risk of potassium loss through fly ash removal in the event of high severity fires. If a high severity fire does not occur then potassium would stay on site and a positive effect similar to Alternative G would take place. The only difference is that in alternative G, potassium would be made available through low severity burning and in alternative A, potassium would be released to the soil through decomposition.

Effects of Alternative B, C and E

Alternative B and C proposes to harvest and treat fuels on 5,381 acres; Alternative E, 5076 acres. Proposed tractor logged acres are: Alternative B, 1,021 acres; Alternative C, 884 acres; and Alternative E, 981 acres.

A direct affect of these management actions, particularly where road building occurs and on some of the tractor harvest units where additional designated skid trails are planned there would be an increase in detrimental soil disturbances such as compaction and displacement. Minor disturbances would occur on skyline and cable units and where fireline is constructed around units. Compaction, displacement and severe burning affect soil physical, chemical and biological properties which indirectly can affect the growth and health of trees and other plants.

On low potassium sites, harvesting on all sites would remove within the tree bole, about 14 percent of the potassium that is contained within a tree, which may have an indirect affect on some plants. A positive affect occurs when the foliage and branches of harvested Douglas-fir trees are allowed to recycle on site, thereby, releasing stored nutrients, such as potassium and nitrogen back to the soil. Douglas-fir consumes and stores more potassium than most other trees. The release and availability of this stored potassium would benefit larch and Western white pine, which require less potassium for growth and maintenance (Garrison and Moore, 1998). These more potassium efficient trees would be planted in all regeneration harvest units and favored within the improvement harvest units. On higher potassium content areas, the effects of yarding tops would result in the greatest loss of potassium with the potential of reducing site productivity, but measuring the effects on site productivity cannot be done with certainty until more research information becomes available.

Alternative B and C proposes 4,438 acres of underburning or " lop and scatter" fuel treatments, while alternative E proposed 4,119 acres. Both of these treatments would retain the maximum possible amount of potassium on the site after logging. All low potassium acres would meet the recommendations of the IFTNC, except for 47 acres which occur next to private land or in fuel break areas These areas, for fire protection purposes require more fuels reduction. The "lop and scatter" fuel treatment would increase fuel loadings which increases the risk of soil damage in the event of a wildfire. This increased fire risk situation would last about six to ten years which is the time needed to decompose the additional fine fuels.

On the higher potassium content areas, Alternatives B and C would grapple pile 667 acres; alternative E, 720 acres. Alternatives B and C would yard tops on 276 acres; alternative E, 237 acres. On the yard top sites about 50 percent of the potassium containing foliage and branches would end up remaining on site in these areas, because in harvesting these dead and dying trees, the falling and skidding process would remove much of this material. The grapple piled sites would end up with more fines removed (potassium) off some areas and concentrated primarily on skidtrails for burning. The effects of grapple piling and yarding tops would result in the greatest loss of potassium with the potential of reducing site productivity, this is hard to predict with any certainty until more research information becomes available.

Alternatives B, C and E have seventeen of the twenty-two proposed units (296 acres) where existing conditions presently may not meet Forest Plan soil quality standards and fourteen of the seventeen proposed units (244 acres) where existing conditions are marginal.

All of the proposed units that may not meet Forest Plan soil quality standards and the marginal units would follow the soil mitigation measures common to all action alternatives listed in Chapter 2. Upon implementation of the soil mitigation measures, these units would either maintain or reduce existing detrimental soil disturbance levels.

Where feasible, in harvest areas that presently may not meet Forest Plan standards, deep subsoiling with a winged subsoiler would be used on all non-permanent landings and skid trails to decrease soil compaction, promote revegetation.

All tractor units that currently meet Forest Plan soil quality standard would incorporate the mitigation measures common to all action alternatives. Implementation of these mitigation measures would insure that Forest Plan soil quality standards are met.

Effects of Alternative D

Alternative D proposes to harvest and treat fuels on 7,483 acres. Helicopter and skyline harvest systems are proposed on 6,268 acres; and 1,215 acres are proposed to be tractor logged.

A direct affect of these management actions, particularly where road building occurs and on some of the tractor harvest units where additional designated skid trails are planned there would be an increase in detrimental soil disturbances such as compaction and displacement. Minor disturbances would occur on skyline and cable units and where fireline is constructed around units. Compaction, displacement and severe burning affect soil physical, chemical and biological properties which indirectly can affect the growth and health of trees and other plants.

On low potassium sites, harvesting on all sites would remove within the tree bole, about 14 percent of the potassium that is contained within a tree, all slash would remain on site to allow potassium and other nutrients to leach into the soil. These sites would have the lowest loss of potassium and the lowest potential to reduce site productivity. A positive affect occurs when the foliage and branches of harvested Douglas-fir trees are allowed to recycle on site, thereby, releasing stored nutrients, such as potassium and nitrogen back to the soil. Douglas-fir consumes and stores more potassium than most other trees. The release and availability of this stored potassium would benefit larch and Western white pine, which require less potassium for growth and maintenance (Garrison and Moore, 1998). These more potassium efficient trees would be planted in all regeneration harvest units and favored within the improvement harvest units . On higher potassium content sites where fuel treatments require grapple piling and yarding of tops, the greatest loss of potassium would occur and a higher potential to reduce site productivity exists, but measuring the effects on site productivity cannot be done with certainty until more research information becomes available.

In this alternative 6,540 acres would receive underburning or " lop and scatter" fuel treatments. Both of these treatments would retain the maximum possible amount of potassium on the site after logging. All low potassium acres would meet the recommendations of the IFTNC, except for 47 acres which occur next to private land or in fuel break areas These areas, for fire protection purposes require more fuels reduction. The "lop and scatter fuel treatment would increase fuel loadings which increases the risk of soil damage in the event of a wildfire. This increased fire risk situation would last about six to ten years which is the time needed to decompose the additional fine fuels.

On the higher potassium content areas, 612 acres would be grapple piled and 331 acres would have tops yarded. On the yard top sites about 50 percent of the potassium containing foliage and branches would end

up remaining on site in these areas, because in harvesting these dead and dying trees, the falling and skidding process would remove much of this material. The grapple piled sites would end up with more fines removed (potassium) off some areas and concentrated primarily on skidtrails for burning.

Nineteen of the twenty-two proposed units (390 acres) where existing conditions presently may not meet Forest Plan soil quality standards and fourteen of the seventeen proposed units (244 acres) where existing conditions are marginal are scheduled to be tractor logged. The remaining three existing units that may not meet standards and the three existing units that are marginal are scheduled to be skyline logged from existing roads. All twenty-two units that exceed Forest Plan soil quality standard and the seventeen that are marginal would follow the soil mitigation measures common to all action alternatives listed in Chapter 2. Upon implementation of the soil mitigation measures these units would either maintain or reduce existing detrimental soil disturbance levels.

Where feasible, In harvest areas that presently may not meet Forest Plan standards, deep subsoiling with a winged subsoiler would be used on all non-permanent landings and skid trails to decrease soil compaction, promote revegetation and move these compacted sites back within meeting Forest Plan standards.

All tractor units that currently meet Forest Plan soil quality standards would incorporate the mitigation measures common to all action alternatives. Implementation of these mitigation measures would insure that Forest Plan soil quality standards are maintained.

Effects of Alternative F

Alternative F proposes to harvest and treat fuel on 4,010 acres. Helicopter and skyline harvest systems are proposed on 3,352 acres; and 658 acres are proposed to be tractor logged.

A direct affect of these management actions, particularly where road building occurs and on some of the tractor harvest units where additional designated skid trails are planned there would be an increase in detrimental soil disturbances such as compaction and displacement. Minor disturbances would occur on skyline and cable units and where fireline is constructed around units. Compaction, displacement and severe burning affect soil physical, chemical and biological properties which indirectly can affect the growth and health of trees and other plants.

On low potassium sites, harvesting on all sites would remove within the tree bole, about 14 percent of the potassium that is contained within a tree, which may have an indirect affect on some plants. A positive affect occurs when the foliage and branches of harvested Douglas-fir trees are allowed to recycle on site, thereby, releasing stored nutrients, such as potassium and nitrogen back to the soil. Douglas-fir consumes and stores more potassium than most other trees. The release and availability of this stored potassium would benefit larch and Western white pine, which require less potassium for growth and maintenance (Garrison and Moore, 1998). These more potassium efficient trees would be planted in all regeneration harvest units and favored within the improvement harvest units. On higher potassium content areas, the effects of grapple piling and yarding tops would result in the greatest loss of potassium with the potential of reducing site productivity, but measuring the effects on site productivity cannot be done with certainty until more research information becomes available.

In this alternative 3,358 acres would receive underburning or " lop and scatter" fuel treatments. Both of these treatments would retain the maximum possible amount of potassium on the site after logging. All low potassium acres would meet the recommendations of the IFTNC. The "lop and scatter fuel treatment would increase fuel loadings which increases the risk of soil damage in the event of a wildfire. This increased fire risk situation would last about six to ten years which is the time needed to decompose the additional fine fuels.

On the higher potassium content areas, 381 acres would be grapple piled and 271 acres would have tops yarded. On the yard top sites about 50 percent of the potassium containing foliage and branches would end up remaining on site in these areas, because in harvesting these dead and dying trees, the falling and skidding process would remove much of this material. The grapple piled sites would end up with more fines removed (potassium) off some areas and concentrated primarily on skidtrails for burning. The effects of grapple piling and yarding tops could potentially affect tree growth and disease resistance due to the loss of potassium, but this is hard to predict with any certainty until more research information becomes available.

Alternative F has thirteen of the twenty-two proposed units (238 acres) where existing conditions presently may not meet Forest Plan soil quality standards and twelve of the seventeen units (219 acres) that are marginal.

All of the proposed units where existing conditions may not meet Forest Plan soil quality standards and the marginal units would follow the soil mitigation measures common to all alternatives listed in Chapter II. Upon implementation of the soil mitigation measures these units would either maintain or reduce existing detrimental soil disturbance levels.

Where feasible, in harvest areas that presently may not meet Forest Plan standards, deep subsoiling with a winged subsoiler would be used on all non-permanent landings and skid trails to decrease soil compaction and promote revegetation.

All tractor units that currently meet Forest Plan soil quality standard would incorporate the mitigation measures common to all action alternatives. Implementation of these mitigation measures would insure that Forest Plan soil quality standards are met.

Effects of Alternative G

Alternative G, which proposes low intensity broadcast burns would have mostly positive effects by releasing potassium which is stored in organic materials and making it available for plant uptake Some minor loss of potassium would occur in fly ash during burning operations. Prescribed burning proposed in Alternative G is different from wildfires because wildfires generally are high intensity burns and occur when fuel moistures are much dryer. Wildfires have an overall negative effect because a large amount of potassium is lost through fly ash removal and increased soil heating would oxidize more soil organic matter. The mitigation measures in Chapter II would apply to all proposed burn units.

Cumulative Effects

Alternative A

Due to predicted high fuel loading, caused by recent Douglas-fir beetle activity, there is a risk of high severity wildfire that could consume soil organic matter. Such a fire, if it were to occur, would be predicted to have a moderate to high effect on soil nutrient and soil structure loss. This could result in reduced tree seedling establishment, tree growth and insect and disease resistance. If a high severity fire does not occur then potassium would stay on site and a positive effect similar to Alternative G would take place. The only difference is that in Alternative G, potassium is made available through low severity burning and in Alternative A, potassium is released to the soil through decomposition.

Alternatives B, C and E

Building roads, ground-based harvesting, slash removal, and cable corridors which operate outside of existing roads, cable corridors, or easily identifiable skid trails would increase the percentage of detrimental soil compaction and displacement on proposed harvest sites. Detrimental compaction is less likely to occur

on some sites which have a high rock fragment content in the surface ash soil. In these alternatives seventeen proposed units currently may not meet Forest Plan soil quality standards and fourteen are marginal. The cumulative impacts resulting from detrimental soil disturbance would be predicted to produce slower growing trees, somewhat less stand volume and possibly less resistance to root rot. Harvesting some tree boles on low potassium sites and the yarding of tops and grapple piling on the higher potassium containing sites may produce less resistance to root rot. On all sites where management actions are planned and present conditions do not meet Forest Plan standards or are marginal, mitigation measures would be implemented to maintain or reduce existing detrimental soil disturbance levels.

Where more potassium efficient trees are planted or favored and where deep subsoiling of compacted soils occurs the above impacts would be predicted to be less.

Alternative B, C and E fall between alternative D and F in relation to tractor logging acres. On the higher potassium containing sites grapple pile acres would be as follows: 667 acres for Alternatives B and C and 720 acres for E and tops yarded would be 276 acres for B and C and 237 acres for E. These alternatives would meet the recommendations of the IFTNC on the low potassium sites, and would meet Forest Plan soil productivity standards.

Alternative D

Roading, ground-based harvesting slash removal, and cable corridors which operate outside of existing roads, cable corridors, or easily identifiable skid trails would increase the percentage of detrimental soil compaction and displacement on proposed harvest sites. Detrimental compaction is less likely to occur on some sites which have a high rock fragment content in the surface ash soil. In this alternative twenty-two proposed units currently may not meet Forest Plan soil quality standards and twenty-four are marginal. The cumulative impacts resulting from detrimental soil disturbance would be predicted to produce slower growing trees, somewhat less stand volume and possibly less resistance to root rot. Harvesting tree boles on low potassium sites and the yarding of tops and grapple piling on the higher potassium containing sites may produce less resistance to root rot. On all sites where management actions are planned and present conditions may not meet Forest Plan standards or are marginal, mitigation measures would be implemented to maintain or reduce existing detrimental soil disturbance levels. Where more potassium efficient trees are planted or favored and where deep subsoiling of compacted soils occurs the above impacts would be predicted to be less.

Alternative D has the most acreage of tractor logging (1,215 acres). On the higher potassium containing sites 612 acres would be grapple piled and 331 acres would have tops yarded. This alternative would meet the recommendations of the IFTNC on all the low potassium sites and the Forest Plan standards.

Alternative F

Building roads, ground-based harvesting, slash removal, and cable corridors which operate outside of existing roads, cable corridors, or easily identifiable skid trails would increase the percentage of detrimental soil compaction and displacement on proposed harvest sites. Detrimental compaction is less likely to occur on some sites which have a high rock fragment content in the surface ash soil. In this alternative twenty-two proposed units currently may not meet Forest Plan soil quality standards and twenty-four are marginal. The cumulative impacts resulting from detrimental soil disturbance would be predicted to produce slower growing trees, somewhat less stand volume and possibly less resistance to root rot. Harvesting some tree boles on low potassium sites and the yarding of tops and grapple piling on the higher potassium containing sites may produce less resistance to root rot. On all sites where management actions are planned and present conditions may not meet Forest Plan standards or are marginal, mitigation measures would be implemented to maintain or reduce existing detrimental soil disturbance levels. Where more potassium efficient trees are planted or favored and where deep subsoiling of compacted soils occurs the above impacts would be predicted to be less.

Alternative F has the lowest acreage of tractor logging (658 acres). On the higher potassium containing sites 381 acres would be grapple piled and 271 acres would have tops yarded. This alternative would meet the recommendations of the IFTNC on all the low potassium sites and the Forest Plan standards.

Alternative G

Alternative G would have a very small loss of potassium off site in the fly ash during burning. Only low intensity broadcast burning would occur in this alternative, so no further cumulative effects are anticipated.

Effects of Opportunities

Wildlife and Watershed Improvements - road obliteration is the beginning of restoring the soil productivity on those sites by decompacting the soil and replacing some of the top soil that was buried under the road fills.

Noxious Weed Treatment - this would also have a positive affect on soil productivity.

None of the other opportunities proposed in Chapter II would effect soil productivity.

Consistency with the Forest Plan

All action alternatives would meet all Forest Plan soil quality standards: Soil disturbing management practices would strive to maintain at least 80 percent of the activity area in a condition of acceptable productivity potential for trees and other managed vegetation; large woody debris would follow the research guidelines of Graham et al., 1994, to insure the maintenance of site productivity.

FISHERIES

REGULATORY FRAMEWORK

The National Forest Management Act (NFMA) (1976) requires that the Forest Service manage for a diversity of fish habitat to support viable fish populations (36CFR219.19). Regulations further state that the effects on these species and the reason for their choice as management indicator species be documented (36CFR219.19(a)(1). The 1969 National Environmental Policy Act (NEPA) requires analysis of projects to insure the anticipated effects upon all resources within the project area are considered prior to project implementation (40CFR1502.16). Section 7 of the 1973 Endangered Species Act (ESA) includes direction that Federal agencies, in consultation with the United States Fish and Wildlife Service, will not authorize, fund, or conduct actions that are likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat. Executive Order 12962 (June 7, 1995) states objectives "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by: (h) evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order."

The Forest Plan for the Idaho Panhandle National Forests (IPNF) provides management goals and objectives for the protection of the fisheries resources. The Inland Native Fish Strategy (INFS) amended the IPNF Forest Plan in August 1995 and contains additional standards and guidelines to protect the aquatic environment.

Proposed activities in the Douglas-fir Beetle Project EIS area were analyzed with respect to these regulatory requirements in the Fisheries sections. Additional regulatory requirements related to fisheries resources (*e.g.* Clean Water Act and Idaho and Washington Water Quality Standards) are addressed in the Water Resources sections.

AFFECTED ENVIRONMENT

Introduction

The cumulative effects areas are nine groups of watersheds. These groups are Priest Lake Face, Granite, Kalispell, Lamb, Binarch, Upper West Branch, Priest River Face, Quartz, and Lower West Branch (see the hydrologic section for descriptions of these areas).

Table III-193. Sixth-scale code watersheds and associated HUC numbers.

Name	HUC Number	Size (Acres)
Priest Lake Face	170102151300	6,016
Granite	170102150600	63,488
Bismark	1701021505	5,888
Lamb	170102150407	19,264
Binarch	170102150405	6,848
Upper West Branch	170102150300	45,376
Priest River Face	170102150100	11,392
Quartz	170102150105	7,296
Lower West Branch	170102150200	44,800

Fish Presence

These cumulative effects areas contain approximately 400 miles of fish-bearing streams. Fish species that inhabit streams in this area include native populations of westslope cutthroat (*Oncorhynchus clarki*), bull trout (*Salvelinus confluentus*), whitefish (*Prosopium* spp.), northern pike minnow (*Ptychocheilus oregonensis*) (formerly squawfish), large-scale sucker (*Catostomus macrocheilus*), sculpin (*Cottus* spp.), longnose dace (*Rhinichthys cataractae*) and redside shiner (*Richardsonius balteatus*) (Simpson and Wallace 1982; district files). Introduced fish species include populations of rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). Fish that are the product of hybridization between native cutthroat trout and exotic rainbow trout and between native bull trout and exotic brook trout may be present. The distribution of some of these fish within streams in the cumulative effects areas can be found on the table on the next page.

The current conditions of the fisheries resources in the cumulative effects areas were established by utilizing interpretation of information from stream inventories, field reviews, historical records, aerial photographs, analysis of watershed conditions, published scientific literature, discussions with Fisheries Biologists from the Idaho Department of Fish and Game, the United States Fish and Wildlife Service (USFWS), and the Idaho Division of Environmental Quality (DEQ), and comprehensive knowledge of the fisheries resources in the Priest River Basin.

Codes for Table III-194

Codes for species: *WCT=westslope cutthroat trout, BT=bull trout, RT=rainbow trout, BkT=brook trout, MW=mountain whitefish, and Scp=Sculpin.*

Codes for access: *Y=access present, no known migration barriers; N=human-caused migration barrier within the stream; N*=natural migration barrier within stream..*

Codes for species present: *Y= Surveyed and present, LY= unsurveyed but likely present, N=Surveyed and not present, LN= unsurveyed but unlikely present, LH=likely historic now not present, H=historic now not present.*

Table III-194. Summary of selected fish species distribution within selected streams in the project area.

Stream Name	HUC	Access	WCT	BT	RT	BkT	MW	Scp
Priest Lake Face	**170102151300**							
Tango Cr	17010215130009	N	Y	LH	N	Y	N	LY
Granite	**1701021506**							
Granite	17010215060000	Y	Y	Y	LN	Y	LH	LY
Fedar	17010215060025	N	Y	LH	LN	Y	N	LY
Bismark*	**1701021505**							
Lamb	**170102150407**							
Lamb	17010215040700	N	H	H	LY	Y	LH	LY
Skip	1701021504071203	N	Y	LH	LN	Y	N	LY
Binarch	**170102150405**							
Binarch	170102150405	Y	Y	H	LY	Y	LH	LY
Upper West Branch	**170102150305**							
Upper West Branch	170102150305	Y	Y	H	Y	Y	LH	LY
Galena	1701021503050100	Y	Y	LH	LN	Y	LH	LY
Solo	1701021503050103	N	Y	LH	LN	Y	LH	LY
Klahowya	17010215030505	Y	LN	N	LN	Y	N	LY
Tola	17010215030519	Y	LN	N	LN	Y	N	LY
Goose	17010215030300	Y	LY	LH	LN	Y	LH	LY
Blonc	17010215030311	Y	LY	LH	LN	Y	N	LY
Consalus	17010215030319	N	Y	LH	LN	Y	LH	LY
Quartz Cr	**170102150105**							
Quartz Cr	17010215010500	Y	Y	LH	LN	Y	LH	LY
Quartz Cr (head)	1701021501050700	Y	Y	LH	LN	Y	LH	LY
Lower West Branch	**1701021502**							
Lower West Branch	17010215020000	N/N*	Y	LH	Y	Y	LH	LY
Ole (South Ole Cr)	17010215020007	Y	LN	N	LN	Y	N	LY
Ole, West Fork	17010215020007	Y	LN	N	LN	Y	N	LY
Tunnel	17010215020005	Y	LN	N	LN	Y	N	LY
Rodger	17010215020011	N	LN	N	LN	Y	N	LY
Mosquito	17010215020013	N*	Y	LH	LN	Y	LH	LY
Guinn	17010215020030	N*	LN	N	LN	Y	N	LY
Kavanaugh	17010215020035	Y	LN	LH	LN	Y	N	LY
Bearpaw	17010215020015	Y	Y	LH	LN	Y	LH	LY
Ojibway	1701021502001707	Y	Y	LH	LN	Y	LH	LY
Blickensderfer	17010215021100	Y	LN	N	N	Y	N	LY
Flat	17010215021300	N	LH	LH	LN	Y	N	LY
Moores	17010215021501	Y	LY	LH	LN	Y	LH	LY
Moores, West Fork	1701021502150500	Y	LY	LH	LN	Y	N	LY
Priest River Face*	**170102150100**							

** No fish-bearing streams in this watershed.*

Due to the large number of fish species within the cumulative effects areas, analysis of direct, indirect, and cumulative effects to fish will use the concept of management indicator species (MIS). Under this concept, larger groups of organisms or communities are believed to be adequately represented by a subset of the group (Idaho Panhandle National Forest Plan 1987). The Forest Plan of the Idaho Panhandle National Forests (IPNF) identifies cutthroat trout and bull trout as potential MIS for fisheries conditions. Westslope cutthroat trout and bull trout are native to some streams in the project area (Bjornn 1957; additional data on file). Westslope cutthroat trout are known to currently be utilizing streams within the project area for spawning, rearing, and over-wintering. Although bull trout were likely historically present in the project area they have not been documented in any of the drainages, except Granite Creek recently. Nonetheless, westslope cutthroat trout

and bull trout have been selected as appropriate MIS for the fisheries analysis of this vegetative and watershed restoration opportunities related to Douglas-fir beetle tree mortality. Although both of these fish do not exist in all streams, in general one of the two is found in all large streams. The life history of one additional species listed on the Regional Foresters sensitive species list, the torrent sculpin, will be included below. Inasmuch as the torrent sculpin is also a cold water species, the effects of this action to these species will be similar, where these species occur in the project area, and will be covered under the effects to the MIS. The torrent sculpin has not been documented within the Priest River Watershed but has been documented in the Pend Oreille Watershed. In addition, these species are likely sensitive indicators for all the cold water biota within the stream segment (Meehan 1991). Two other sensitive species, the burbot and redband cutthroat, will not be addressed in the EIS because they are not known to occur in the Preist River Watershed Watershed (Simpson and Wallace 1978).

Westslope Cutthroat Trout

Westslope cutthroat trout are listed as "sensitive" by Region 1 of the USDA Forest Service and are listed as "species of special concern" by the State of Idaho. In addition, the U.S. Fish and Wildlife Service (USFWS) lists westslope cutthroat trout as a "Species of Concern" with respect to section 7(c) of the 1973 Endangered Species Act (ESA) (3/10/99 letter, FWS 1-9-99-SP-158. Also, this species is under review for listing under the Endangered Species Act).

Westslope cutthroat trout are native to all of the 6th HUC watersheds which are contained in this project area (references and data on file at district office). Their preferred habitat is cold, clear streams that possess rocky, silt-free riffles for spawning and slow, deep pools for feeding, resting, and over-wintering (Reel 1989). Pools are a particularly important habitat component as cutthroat trout occupy pool habitat more than 70% of the time (Mesa 1991). Other key features of cutthroat habitat are large woody debris (LWD) for persistent cover and habitat diversity as well as small headwater streams for spawning and early rearing.

Resident life history strategies of westslope cutthroat trout are currently present in watersheds within the project area (data on file at district office). Resident populations remain in river tributaries throughout their life. Certain life histories such as (fluvial and adfluvial fish) use river tributaries for early rearing and spring spawning as adults but typically out-migrate to river (fluvial) or lake (adfluvial) habitat as they mature. In the fall, fish that have not previously returned to river and lake areas migrate to deeper water where they congregate and over-winter (Bjornn 1975). Streams within the project area may have historically been utilized by westslope cutthroat trout representing all life history strategies during various phases of their life cycle; however, currently mostly resident fish exist and are generally confined to headwater streams.

A population status review of westslope cutthroat trout in Idaho has determined that populations in northern Idaho have declined over their historic distribution with viable populations existing in only 36% of the original Idaho range. The primary cause of the decline was found to be habitat degradation (Rieman and Apperson 1989).

Within the Priest Lake watershed, cutthroat trout have been seriously affected by the presence of two introduced species; brook trout and lake trout. Brook trout out-compete westslope cutthroat trout in areas where habitat is degraded, and lake trout reduce the survival of adfluvial cutthroat through predation.

Of the streams listed within Table III-194, Granite Creek and Binarch Creek are likely the most important to species persistence to westslope cutthroat within the analysis areas. Among the streams in the analysis area, Granite Creek has the best overall habitat. It is a large drainage with tributaries with good habitat condition and connectivity to other drainages and Priest Lake. Binarch Creek contains very good habitat in the headwaters where cutthroat trout are currently found, although downstream habitat is high in sediment.

In addition to these streams, the connectivity between stream habitat and the lake habitat is extremely important to cutthroat exhibiting an adfluvial life history.

Bull Trout

Bull trout may be native to the all the 6th HUC watersheds within the project area. Bull trout were listed (June 10, 1998) as a "threatened" species under the ESA. Currently bull trout are known to inhabit Granite Creek as well as the Priest Lake system. Bull trout appear to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Habitat characteristics including water temperature, stream size, substrate composition, cover and hydraulic complexity have been associated with the distribution and abundance (Dambacher and others, in press; Jakober 1995; Rieman and McIntyre 1993).

Stream temperature and substrate composition are important characteristics of suitable bull trout habitats. Bull trout have repeatedly been associated with the coldest stream reaches within basins. The lower limits of many strong bull trout distributions mapped by Lee et al. (1997) correspond to a mean annual air temperature of about 4 degrees Centigrade (ranging from 3 to 6 degrees Centigrade) and should equate to ground water temperatures of about 5 to 10 degrees Centigrade (Meisner 1990). Water temperature may be strongly influenced by land management (Henjum et al. 1994).

In a status review of bull trout on the Idaho Panhandle National Forests, stocks from the Priest Lake Watershed were considered to be at high risk of extinction (Cross 1992). Genetic analysis has shown that bull trout within many sub-basins of northern Idaho may be unique stocks (B. Rieman, Forest Service Research, personal communication), but they are closely linked to the upper Columbia River clad - one of three major groupings of bull trout throughout the Columbia and Klamath River drainages (Williams, unpublished).

Of the streams listed within Table III-194, Granite Creek is likely the most important to species persistence for bull trout within the analysis areas. Besides being the only drainage within the analysis area known to contain bull trout, Granite Creek has the best habitat within the analysis area. This large system has tributaries with good habitat condition and connectivity between other drainages and Priest Lake is good. The connectivity to Priest Lake is especially important to adfluvial bull trout.

Torrent Sculpin

Torrent Sculpin were added to the Idaho Panhandle's sensitive species list March 12, 1999. This species has not been found in Priest River and larger tributary streams within this watershed. Their preferred habitat is riffle habitat in medium to wide streams and rivers (Markle et al. 1996). Large adults (>150 mm), however are found in pools. Spawning usually occurs in May and June and occurs in riffles with moderate to swift flows. The range of torrent sculpin overlaps with both westslope cutthroat and historic bull trout and are also a cold water species. Because this species primarily inhabitats large streams, this species would only be affected by this project if the magnitude of the effects altered habitat conditions in the larger streams. This species is not known to inhabit this watershed but limited surveys have been completed for sculpin. Because this is a cold water species, possible effects on this species will be covered by analyzing effects on the cold water MIS.

Habitat Connectivity

Environmental conditions in the cumulative effects area have been influenced by natural events and processes as well as human activities. Effects of natural disturbances such as volcanic eruptions (*e.g.* Mt. St. Helens, Mt. Mazama), historic fires, landslides, and flooding have interacted with other land-evolving processes (*e.g.* geologic up-lift and stream channel down-cutting) to form the basic character of watersheds and the dependent stream resources. Due to variability in the location, frequency, intensity, and ultimately, the effects of natural processes on the physical environment, dynamic landscapes with diverse conditions are formed at various spatial scales. Biological communities including native fish populations led to development of functional ecosystems that are inherently resilient to effects from natural disturbance regimes representing pulse-type disturbance (Reeves *et al.* 1995). Pulse disturbances influence the natural range of environmental conditions that are expected for ecosystems functioning at broad geographic scales but typically allow systems to begin recovering to pre-disturbance conditions soon after the disturbance.

Natural disturbance regimes and their associated properties (*e.g.* sedimentation rates and other influences on aquatic habitat) have been altered in the cumulative effects area by human activity. Land use activities that have modified natural disturbance characteristics include railroads, roads, flumes/chutes, settlements/towns, sheep grazing, mining, stream modifications (constriction, channelization, diversions, dams, culverts, and cleaning/removal of woody debris), logging, and fire suppression. Many of these human influences are considered press-type disturbances that continue to affect the condition and trend of fisheries resources long after the initial disturbance. Press disturbance differs from pulse disturbance in several aspects but generally press disturbance is persistent in ecosystems and impairs the ability for ecosystems to recover to pre-disturbance conditions (Reeves *et al.* 1995). Within the cumulative effects area, the recovery process from pulse disturbance has been hindered by the presence of various press disturbances. The following discussion relates these findings to the existing condition of fish habitat.

In general, the landscape within the Idaho Panhandle can be broadly described by four different disturbance regimes. The first of these are areas that were not burned by large fires in the first part of this century and not significantly altered by anthropogenic activities; there are few of these areas on the Forests. The second of these, areas not burned by large fires in the first part of this century but managed by humans since, describes most of the area not burned near the turn of the century. The third of these - areas burned by large fires in the first part of this century and have not been entered. And the final of these - areas burned by large fires in the first part of this century and now currently managed. The disturbance history has played a large role in determining stream habitat conditions.

Description of Unburned Watersheds Without Management Activities

There are few watersheds (greater than 5000 acres) within the Forest that meet these criteria and none within the nine cumulative effect analysis areas. Conditions of these watersheds include complex stream conditions with complex fish habitat. The probability of persistence of resident fish within these basins is high. The stream conditions within these basins serve as reference conditions for other unburned watersheds.

Unburned and Harvested watersheds

Other watersheds not burnt since the early 1900's in the cumulative effects area have experienced more recent disturbances associated with land management. Various intensities of road activity (*e.g.* construction, reconstruction, and maintenance), timber harvest, mining, and/or recreational facilities have influenced the rate of fish habitat recovery from historical disturbances in several streams. The existing transportation system in the cumulative effects area is an extension of historic road locations that, in many cases, paralleled stream courses from the valley bottoms to the mountain ridges. Riparian roads in the cumulative effects area have high levels of erosion during flood events, accelerate stream sedimentation rates, reduce channel stability, inhibit flood plain functions, reduce large wood debris (LWD) recruitment potential, reduce stream shade, and otherwise impair the development and maintenance of quality fish habitat. The following table lists fish-bearing streams that have valley bottom roads which are affecting fish habitat conditions at various levels. Existing fish habitat conditions are generally below desired levels and the trend (either static or toward degradation) is not favorable in all these subwatersheds within this area.

Table III-195. Unburned and Harvested Watersheds, Priest Lake Planning Area.

Stream Name	HUC	Area of Riparian Roads	Area of Riparian Harvest
Priest Lake Face			
Tango	17010215130009	>25%	<10%
Granite	**1701021506**		
Granite	17010215060000	>25%	10-25%
Fedar	17010215060025	>25%	<10%
Binarch	**170102150405**		
Binarch	170102150405	>25%	10-25%
Upper West Branch	**170102150305**		
Upper West Branch	170102150305	>25%	10-25%
Galena	1701021503050100	>25%	>25%
Solo	1701021503050103	>25%	10-25%
Klahowya	17010215030505	10-25%	10-25%
Tola	17010215030519	>25%	10-25%
Goose	17010215030300	>25%	10-25%
Blonc	17010215030311	>25%	>25%
Consalus	17010215030319	>25%	10-25%

Burned and Unharvested Watersheds

Early 20th century fires burned over these parts of the cumulative effects area and altered the condition and trend for many streams. Areas that reburned within a relatively short time span have been slower to recover from these fires. Most stream channels in areas that have not been entered for harvest have adjusted to altered hydrologic conditions resulting from historic fires and these channels are generally stable. Riparian areas affected in this way typically offer less protection for stream temperatures (*i.e.* stream shade) and have a lower recruitment potential for LWD. A lack of LWD recruitment can inhibit the development and maintenance of diverse habitat conditions including quality pool habitat and complex cover. Though the condition of fish habitat (*e.g.* maximum stream temperatures, aquatic habitat diversity, and cover complexity) in watersheds that have most recently been influenced, primarily by these wildfire without harvest disturbances, are at various stages of recovery, the trends are favorable for sustaining salmonid populations. There are no watersheds in the project area that were burned but not harvested. There are, however, watersheds within the cumulative effects area that meet this description.

Burned and Harvested Watersheds

Streams in watersheds that were logged following recent historic fires have experienced similar but more prolonged residual effects than those streams in watersheds where salvage logging did not occur. Logging and associated activities intensified the effects of fires because unburned trees that would otherwise have been available to facilitate fish habitat maintenance and recovery were removed by various means (*e.g.* roads, railroads, flumes, and splash dams) which often resulted in additional disturbance to stream channels and associated riparian areas. Increased impacts to streams and riparian areas have extended the recovery period necessary to develop quality fish habitat. As a result, fish habitat conditions in streams that have most recently been influenced, primarily by wildfires and the ensuing salvage logging activities, are generally earlier in the recovery process than streams in watersheds that were not salvage logged. Watersheds that have been burned and harvested are listed below.

Table III-196. Burned and Harvested Watersheds, Priest Lake Planning Area.

Stream Name	HUC	Area of Riparian Roads	Area of Riparian Harvest
Bismark	**1701021505**		
Lamb	**170102150407**		
Lamb	17010215040700	>25%	10-25%
Skip	1701021504071203	>25%	10-25%
Priest River Face	**1701021501**		
Quartz Cr	**170102150105**		
Quartz Cr	17010215010500	>25%	10-25%
Quartz Cr (head)	1701021501050700	>25%	10-25%
Lower West Branch	**1701021502**		
Lower West Branch	17010215020000	>25%	10-25%
Ole (South Ole Cr)	17010215020007	>25%	10-25%
Ole, West Fork	17010215020007	>25%	10-25%
Tunnel	17010215020005	>25%	<10%
Roger	17010215020011	10-25%	10-25%
Mosquito	17010215020013	>25%	10-25%
Guinn	17010215020030	>25%	<10%
Kavanaugh	17010215020035	>25%	>25%
Bearpaw	17010215020015	>25%	10-25%
Ojibway	1701021502001707	>25%	10-25%
Blickensderfer	17010215021100	>25%	10-25%
Flat	17010215021300	>25%	>25%
Moores	17010215021501	>25%	10-25%
Moores, West Fork	1701021502150500	>25%	10-25%

General Effects of Land Management Activities

Newer roads and some historic roads within the planning area have been constructed in more stable locations higher on the hillslopes and are of less concern for fisheries resources (see hydrologic assessment). However, roads on hillslope locations can contribute to impaired fish habitat conditions. These roads can elevate stream sedimentation by increasing surface erosion potential and mass erosion potential. Fill failures from sections of riparian roads during the winter of 1995-1996 delivered approximately 450 cubic yards of material in eighteen streams within the analysis area and considerably altered the condition and trend for fish habitat.

Recent (past five years) timber harvest units, mining, and recreational facilities have generally had a less dramatic effect on fisheries resources than historical fires, historical salvage operations, and the existing transportation system (Furniss et al. 1991). Recent timber harvests and associated roads have contributed to cumulative effects that are affecting recovery of fish habitat conditions in these streams.

The quality of fish habitat conditions in the cumulative effects area has generally been compromised but are adequate to support viable populations of some coldwater biota. Diverse conditions of the habitat components (stream temperatures, aquatic habitat diversity, cover complexity, and channel stability) that are primarily responsible for regulating populations of native salmonids in the cumulative effects area have enabled these populations to persist, albeit at suppressed levels. Analysis of existing conditions indicates that many streams in the cumulative effects area continue to recover from the residual effects from historic pulse-type (fires, volcanos) disturbance acting in isolation or in combination with effects from on-going press-type (timber harvest, road building) disturbances (Chamberlin et al 1991).

One possible effect of management on MIS fish species that can not be explored within the fisheries section of the EIS is changes in peak flow. Although large-scale fires in Northern Idaho resulted in the historic condition of this basin often having more openings than the current condition (Idaho Panhandle Forest Monitoring Plan 1997) it is unlikely any changes in peak flows resulting from these management activities will have a direct, indirect, or cumulative effect outside the conditions in which these fish evolved. In addition, Jones and Grant (1996) state the natural range of variability of peak flow varies by an order of magnitude whereas the increases associated with human activities are no more than 50%. This, once again suggests that fish have evolved to live through variable flows. The condition fish have not evolved with, however, is habitat that has been greatly simplified as the result of habitat modification - this will be covered in environmental consequences.

Because most of the planning area is in watersheds that have been negativily affected by human management the goal for future management is to restore processes that form stream habitat. The easiest way to achieve this goal is to reduce the effects of roads while maintaining or improving riparian habitat conditions.

ENVIRONMENTAL CONSEQUENCES

Methodology

Direct and Indirect effects

Existing conditions were established for primary habitat components believed to be influencing the production potential of the MIS fish species within the nine cumulative effects areas. Changes to these habitat components by the action alternatives are addressed by measuring changes in physical structures that affect the habitat components important to fish and are affected by management actions. Habitat components of interest include stream temperature, aquatic habitat diversity, cover complexity, and channel stability.

Stream temperature is one indicator of aquatic habitat conditions for this project area (Hicks et al. 1991). Stream temperature information collected during stream surveys is evaluated in relation to Idaho State Water Quality Standards for designated beneficial uses. The direct removal of riparian vegetation through road construction and timber harvest can indirectly change stream temperature by increasing sunlight to the water.

Habitat diversity (composition and quality) is another indicator of aquatic habitat conditions and is assessed as the quantity and degree of development of various types of aquatic habitat (*e.g.* pools, riffles). Stream segments possessing numerous habitats with a wide variety of stream velocities, water depths, and physical habitat configurations are considered more diverse and have a greater potential for meeting the habitat requirements of naturally reproducing trout populations. Removal of riparian vegetation, which reduces instream wood, along with increases in bedload and sediment, and changes in stream morphology can affect the composition and quality of habitat.

Cover complexity is also an indicator of habitat conditions and is evaluated by the degree of habitat partitioning by various structural elements such as large woody debris (LWD), boulders, and undercut banks. This physical separation within habitat units can help maximize fish production by decreasing competition and aggression, reducing predation, increasing carrying capacity, and producing micro-habitat conditions that minimize energy requirements and provide refugia for fish inhabitants. The same surrogates used to reflect changes in habitat diversity are used to display changes to cover complexity, particularly instream wood and channel morphology.

Channel stability is another indicator of fish habitat conditions because it influences the quality of pool habitat as well as helps to establish the trend for aquatic habitat conditions. Channel stability is discussed in the Water Resources report and incorporated into the assessment of fisheries resources. The relationship between upslope processes and stream channel condition were also assessed by incorporating the analysis of the hydrologic condition within the project area. Changes to channel stability are highly dependent upon changes

in water yield and timing, and bedload movement. Other selected features that are believed to influence the condition of riparian areas, and subsequently fish habitat are also discussed.

Indirect effects

Because of the difficulty of directly measuring stream habitat components as well as delay between land managment actions and altered stream conditions this EIS will be tracking management actions that could alter stream conditions. The relationship between the habitat componenet and the measurement of change is discussed below.

Riparian Harvest: For this EIS, the amount of riparian harvest will be a surrogate for changes in stream temperature, habitat diversity, cover complexity, and channel stability. The direct effect of riparian harvest is the reduction of shade and large wood component near streams. The indirect effects of reducing the amount of streamside vegetation include altering timing and amount of sediment delivery, wood loading in stream, stream temperature, and the hydrologic regime (Meehan et al. 1991). The cumulative effects of riparian harvest can reduce egg-to-fry survival (by increased fines in redds) and reduce adult survival (by increasing temperature outside of tolerated range and/or by altering carrying capacity by reducing highly utilized habitat) of MIS species. For purposes of consistency in this analysis, an average distance of 300 feet from fish bearing stream will be considered as riparian habitat. Although not all the vegetation within this 300 foot buffer from stream will consist of vegetation that is dependent on the water table, it does provide conditions necessary to maintain these types of vegetation (FEMAT, 1993). In addition, riparian harvest within approximately 75 feet of intermittent streams will be considered riparian harvest. By maintaining ripairian habitat, the Forest will trend toward meeting the large woody debris Riparian Management Objective in INFS.

Sediment Delivery Risk: The greatest risk is at stream crossings, where culvert failures can introduce large amounts of sediment into stream channels. If crossings fail, a direct effect of sediment delivery can be reduced passage of fish; however, the most likely effects are indirect and cumulative in nature. The indirect effects of these failures include increased fine sediment in redds, and channel simplification due to torrents. The cumulative effects of additional sediment delivery can be reduced egg-to-fry survival (by increased fines in redds) and reduce adult survival (by altering carrying capacity by reducing highly utilized habitat such as pools) of MIS species. The cumulative effects related to road failures can ultimately lead to a decline in fish numbers (Furniss et al. 1991). Reducing the amount of sediment entering streams can result in trends towards the Pool Frequency and the Width/Depth Riparian Management Objectives.

Increased Fish Passage: The placement of culverts at stream crossings can alter the ability of fish to access stream habitat above the culvert. The direct effects of modifying these culverts to allow for migration is increased fish passage. The indirect effects of fish passage is the movement of fish to portions of streams not previously used; however, replacement activities may increase short-term sediment production. The cumulative effects of increased passage is the increased probability of persistence of the MIS species. Passage for this analysis will be focused on spring migration of adult westslope cutthroat and summer/fall migration of bull trout.

Reduced Length of Encroaching Roads: The fourth of these surrogates will be the amount of encroaching road removed as a result of restoration activities. A direct effect of reducing the length of encroaching roads is reduced flow velocity. Indirect effects include increased habitat complexity and fish carrying capacity. Cumulative effects include increased numbers of fish. Because valley bottom roads pose a significant risk to fish (Dose and Roper 1994, Hick et al. 1991), reducing these roads is extremely important to maintaining the long-term viability of fish species, as well as maintaining terrestrial species within the basin that rely on riparian habitat. By reducing the amount or encroaching road the result will be trending towards the Pool Frequency and the Width/Depth Riparian Management Objectives.

Effects to Management Indicator Habitat Components

Some activities, in addition to the activities described in the EIS are common to all alternatives and are described under "Reasonably Foreseeable Activities" (Appendix E) . All future decisions in the Reasonably Forseeable will need to complete consultation with the United States Fish and Wildlife Servcie prior to the decsion. Each of these activities has the potential to contribute to various aspects of watershed resource conditions. Protective measures were recommended and incorporated into the designs for most of these projects allowing watershed resources to be maintained. Effects to fisheries resources can be expected from these activities, and any action alternative under this analysis is considered to have additive effects when combined with the No Action Alternative.

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

Riparian Harvest: No harvest would occur within Riparian Habitat Conservation Areas under any of the alternatives. As a result there would be no significant direct, indirect, or cumulative effect to the fisheries resource.

Sediment Delivery Risk: The short term effects are related to the number of new culverts crossing streams and the length of new road. Any value greater than zero is a short term increase in risk. In contrast, values in the long term effects are the amount of annual risk of sediment delivery. Any value in these columns less than in Alternative A is a reduction in risk while any values greater than Alternative A is an increased risk.

All alternatives, other than the No Action Alternative (Alternative A) would result in a significant decrease in the risk of failure at stream crossings. There would be, however, a short-term increase in risk within three of the cumulative watershed effects area related to temporary road building in Alternative B, Alternative D, and Alternative E. Because the temporary roads would not be located close to streams, they have only a low probability of delivering sediment to the stream; therefore, there would be no significant cumulative effects from these activities.

Table III-197. Approximate amount of sediment delivery risk associated with stream-crossing restoration activities.

HUC	Alt. A Short term	Alt. A Long term	Alt. B Short term	Alt. B Long term	Alt. C Short term	Alt. C Long term	Alt. D Short term	Alt. D Long term	Alt E Short-term	Alt E Long term	Alt F Short term	Alt F Long term	Alt G Short term	Alt G Long term
Priest Lake Face	0/0	NI	0/0	NI*	0/0	NI*	0/0	NI*	0/0	NI*	0/0	NI*	0/0	NI*
Granite	0/0	0	0/0	-9.9	0/0	-9.9	0/0	-9.9	0/0	-9.9	0/0	-9.9	0/0	-9.9
Bismark	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI
Lamb	0/0	NI	0.1/0	NI*	0/0	NI*	0.3/0	NI*	0.1/0	NI*	0.3/0	NI*	0/0	NI*
Binarch	0/0	NI	1.3/0	NI	0/0	NI	1.3/0	NI	1.3/0	NI	0.4/0	NI	0/0	NI
Upper West Branch	0/0	-29.3*	4.6/0	-40.2*	0/0	-40.2*	5.4/0	-40.2*	4.1/0	-40.2*	0.4/0	-29.7*	0/0	-40.2*
Priest River Face	0/0	NI	0.5/0	NI	0/0	NI	0.5/0	NI	0.5/0	NI	0.5/0	NI	0/0	NI
Quartz	0/0	0	0.7/0	-0.2	0/0	-0.2	0.8/0	-0.2	0.8/0	-0.2	0.8/0	-0.2	0/0	-0.2
Lower West Branch	0/0	0	5.8/0	-9.2*	0/0	-9.2*	6.1/0	-9.2*	5.8/0	-8.2*	4.9/0	-7.8*	0/0	-9.2*

Data is for inventoried stream crossings and roads used in alternatives. *Short term* is measured by miles of new road (temporary and permanent road miles/number of new stream crossings). *Long term* is the potential reduction (-) or addition of yearly sediment that could be delivered from the inventoried transportation system. Transportation systems include both non system and system roads. Risk reduction includes the upgrading and /or removal of stream crossings (risk of failure multiplied by sediment volume). NI means no risk sites were inventoried. An asterisk (*) indicates that known non-inventoried culverts will be removed, therefore the long term risk reduction will actually be greater than is quantified in the table.

__Increased Fish Passage:__ Alternatives that remove barriers to fish passage would be a benefit to the MIS species. The greater the value, the greater the benefit.

The same amount of habitat would be made available to fish in all action alternatives excecpt Alternative F (please refer to the table below). The removal of these barriers through culvert removals and upgrades would allow the fish to utilize more habitat than is present under the existing conditions and may lead to more genetic diversity by reconnecting isolated stocks of fish. These projects would have no negative cumulative effects to the MIS within any of the cumulative watershed effect areas. In contrast, where passage is increased, there would likely be a direct benefit to the MIS species. At the time these culverts would be upgraded there might be a localized insignificant direct and indirect effect on the fish resource.

Table III-198. Increased fish passage, Priest Lake Planning Area (approximate miles).

Watershed	Alt. A	Alt. B	Alt. C	Alt. D	Alt E	Alt. F	Alt. G
Priest Lake Face	0	0	0	0	0	0	0
Granite	0	3.6	3.6	3.6	3.6	3.6	3.6
Bismark	0	0	0	0	0	0	0
Lamb	0	0	0	0	0	0	0
Binarch	0	0	0	0	0	0	0
Upper West Branch	0	2.0	2.0	2.0	2.0	0	2.0
Priest River Face	0	0	0	0	0	0	0
Quartz	0	0	0	0	0	0	0
Lower West Branch	0	0	0	0	0	0	0

__Reduced Length of Encroaching Roads:__ Alternatives that reduce the length of encroaching roads would have a short term increase in sediment but would result in the long term benefit to MIS species.

The same amount of improved habitat would be made available to fish in all action alternatives except Alternative F, which would be slightly less. In the short term there would be an increase in fine sediment and reduction in cover where the road prism is currently in contact with the stream. Reduction of this encroachment in the long term would allow the stream courses to settle into a regime where the stream would be able to interact with the flood plain. Large wood recruitment would improve over time as these areas regenerate to forest and provide fallen trees into the stream and riparian areas. Habitat complexity would increase and provide more pool and hiding/resting habitat for fish. Sediment would slowly go into storage behind these obstructions, and should result in less bedload movement through the system. The short-term increase in sediment delivery in combination with the long-term benefit associated with the removal of encroaching roads would not result in a significant cumulative effect to the MIS within the nine cumulative watershed effect areas. Given the amount of encroaching roads within many of the cumulative effects areas, the benefits of restoration activities would be minimal but are a necessary first step towards restoration of these watersheds.

Of the miles of encroaching road to be reduced, all but 0.3 miles in Upper West Branch will be removed from the RHCA completely either by obliteration or relocation. In Upper West Branch, 0.3 miles will be moved out of the active floodplain but will remain within the RHCA. In Upper West Branch the removal of approximately 1.4 miles of encroaching roads may prove to be a significant benefit to the fisheries resource.

Table III-199. Reduced length of encroaching roads.

Watershed	Alt. A ST	Alt. A LT	Alt. B ST	Alt. B LT	Alt. C ST	Alt. C LT	Alt. D ST	Alt. D LT	Alt E ST	Alt E LT	Alt F ST	Alt F LT	Alt G ST	Alt G LT
Priest Lake Face	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Granite	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Bismark	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Lamb	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Binarch	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Upper West Branch	nc	0.1	-	1.4	-	1.4	-	1.4	-	1.4	-	1.0	-	1.4
Priest River Face	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Quartz	nc	0	-	0.3	-	0.3	-	0.3	-	0.3	-	0.3	-	0.3
Lower West Branch	nc	0	-	0.2	-	0.2	-	0.2	-	0.2	nc	0	-	0.2

***LT*= number of miles of reduced. *ST*= short-term increase in sediment where a minus (-) symbol indicates that some small amount of sediment may enter the stream channel during restoration activities and nc =no change.**

Effects on Westslope Cutthroat Trout and Bull Trout Individuals and Populations

Definitions

The impact to MIS species will be described using the following definitions:

No change in population conditions means that there would likely be no net positive or negative effect to the population within the cumulative watershed effects areas. No change in riparian or stream conditions.

Likely to result in a long-term reduction in risk of past management actions to individuals indicates the action taken within the watershed is limited in nature but would result in a net benefits to individuals when compared to the existing condition. Actions that result in the reduction of risk to individuals include isolated culvert upgrades and small scale reduction of encroaching roads with little increased risk associated with road building or riparian harvest. A change in stream and riparian conditions so that Riparian Managent Objective are trended towards at the segment or reach scale.

Likely to result in a long term reduction in risk of past management actions to population indicates the actions is broad enough in scope to effect individuals throughout the basin thereby improving the condition of the population within the cumulative watershed effects area when compared to the existing conditions. Actions that result in the reduction of risk to populations include widespread culvert upgrades, large scale reduction of encroaching roads, and/or increased fish passage without increased risk associated with road building or riparian harvest. A significant change in stream and riparian conditions so that Riparian Managent Objective are trended towards at the subwatershed scale.

Likely to result in a long-term risk in individuals indicates the action taken within the watershed is limited in nature but would result in a net harm to individuals when compared to the existing condition. Actions that result in the increased of risk to individual include road building or harvesting riparian areas without a widespread effort to upgrade culverts and reduction of encroaching roads. A change in stream and riparian conditions so that Riparian Managent Objective are trended away from at the segment or reach scale.

Likely to result in a long-term decline in populations indicates the action taken within the watershed is widespread and would result in a net harm to individuals when compared to the existing condition. Actions that result in the increased of risk to populations include widespread road building without a widespread effort to upgrade culverts and the reduction of encroaching roads. A change in stream and riparian conditions so that Riparian Managent Objective are trended away from at the subwatershed scale.

Determination of Effects to Management Indicator Species

The following tables portray effects of the ongoing (including the reasonably foreseeable -- Appendix E), and proposed activities, and are designed to show the trend that would be attained with each of the alternatives, by watershed analysis area. These calls integrate the preceding evaluations of habitat components and the foreseeable actions described above. The X'd blocks are the composite rating of the cumulative effects of the all actions in an alternative on the MIS species and summarized by the cumulative watershed effects areas.

Table III-200. Effects to Management Indicator Species, ALTERNATIVE A.

Watershed	Likely to result in a long term decline in populations	Likely to result in a long term risk in individuals	No change in population conditions	Likely to result in a long term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT currently within Basin
Priest Lake Face			X				X
Granite			X				
Bismark			X			X	X
Lamb			X				X
Binarch			X				X
Upper West Branch				X			X
Priest River Face			X			X	X
Quartz			X				X
Lower West Branch			X				X

Cumulative Effects

Historically, all the above listed watersheds possibly had abundant populations of cutthroat trout and bull trout. Currently, no basin has a strong population of cutthroat and only Granite has a known population of bull trout. Although some of the decline is related to land management actions (especially in Bismark, Upper West Branch, Lamb, Binarch, Priest River Face, Quartz, and Lower West Branch), part of the decline is the result of two introduced species; lake trout and brook trout. The population trend of cutthroat trout has been a rapid decline but now appears to be stabilizing or declining at a slower rate. Bull trout have declined to a point where there may only be several hundred adults in a basin where historically over 1,000 were caught by anglers each year. In watersheds with large amounts of private land ownership in the fish bearing portions of the drainages (Upper West Branch and Lower West Branch), adfluvial cutthroat trout populations will likely be negatively affected as these private land owners continue to dike these stream channels and brook trout populations increase. The effect of Alternative A will result in no change in the current condition or trend in the MIS (which is a stable population of cutthroat in basins where private land owners or introduced species have limited influence, a declining population of adfluvial cutthroat in basins where private land owners alter stream channels or brook trout populations are expanding, and a non-viable population of bull trout in all but one watershed) in any watershed except Upper West Branch, where foreseeable future actions (road obliteration and removal of culverts) will benefit MIS individuals. Because the actions only have effects at the stream reach scale, this project will have no incremental effect at the watershed scale. This No Action Alternative does not increase the level of risk to these species by timber harvesting or improve the condition as a result of restoration.

Consistency with Management Direction

Based on the information presented in this document this alternative would meet the Forest Plan as amended by the Inland Native Fish Strategy.

Table III-201. Effects to Management Indicator Species, ALTERNATIVE B.

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS (Positive Components)	DIRECT AND INDIRECT EFFECTS (Negative Components)
Priest Lake Face				X			X	Reduced Risk	
Granite				X				Increased Passage, Reduced Risk	
Bismark			X			X	X		
Lamb				X			X	Reduced Risk	Temporary road building
Binarch			X				X		Temporary road building
Upper West Branch				X			X	Increased Passage, Reduced Risk, reduced encroaching road	Temporary road building
Priest River Face			X			X	X		Temporary road building
Quartz				X			X	Reduced Risk, reduced encroaching road	Temporary road building
Lower West Branch				X			X	Reduced Risk, reduced encroaching road	Temporary road building

Cumulative Effects

Historically, all the above listed watersheds possibly had abundant populations of cutthroat trout and bull trout. Currently no watershed has a strong population of cutthroat trout and only Granite has a known population of bull trout. Although some of the decline is related to land management actions (especially in Bismark, Upper West Branch, Lamb, Binarch, Priest River Face, Quartz, and Lower West Branch), part of the decline is the result of two introduced species; lake trout and brook trout. The population trend of cutthroat trout has been a rapid decline but now appears to be stabilizing or declining at a slower rate. Bull trout have declined to a point where there may only be several hundred adults in a basin where historically over 1,000 were caught by anglers each year. In watersheds with large amounts of private land ownership in the largest fish-bearing portions of the drainages (Upper West Branch and Lower West Branch), adfluvial cutthroat trout populations will likely be negatively affected as these private land owners continue to dike these stream channels and as brook trout populations increase. The effects of Alternative B will be no change in the existing condition in Bismark, Binarch, and Priest River Face. In contrast, there will be a benefit at the scale of a stream segment in Priest Lake Face, Granite, Lamb, Upper West Branch, Quartz, and Lower West Branch. Because the actions only have effects at the stream reach scale, this project will have no incremental effect at the watershed scale. Although there is no cumulative effect from this project at the watershed scale, the overall effects of this project in combination with the past, present and reasonably foreseeable actions is to begin to positively alter habitat conditions so that populations of the MIS can begin to increase. The reason for this trend toward recovery is the watershed restoration opportunities that are presented through the harvest of approximately 5,000 acres of harvest.

Consistency with Management Direction

Based on the information presented in this document this alternative would meet the Forest Plan as amended by the Inland Native Fish Strategy.

Table III-202. Effects to Management Indicator Species, ALTERNATIVE C.

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS (Positive Components)	DIRECT AND INDIRECT EFFECTS (Negative Components)
Priest Lake Face				X			X	Reduced Risk	
Granite				X				Increased Passage, Reduced Risk	
Bismark			X			X	X		
Lamb				X			X	Reduced Risk	
Binarch			X				X		
Upper West Branch					X		X	Increased Passage, Reduced Risk, reduced encroaching road	
Priest River Face			X			X	X		
Quartz				X			X	Reduced Risk, reduced encroaching road	
Lower West Branch				X			X	Reduced Risk, reduced encroaching road	

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no basin has a strong population of cutthroat trout and only Granite has a known population of bull trout. Although some of the decline is related to land management actions (especially in Bismark, Upper West Branch, Lamb, Binarch, Priest River Face, Quartz, and Lower West Branch), part of the decline is the result of two introduced species; lake trout and brook trout. The population trend of cutthroat trout has been a rapid decline but now appears to be stabilizing or declining at a slower rate. Bull trout have declined to a point where there may only be several hundred adults in a basin where historically over 1,000 were caught by anglers each year. In watersheds with large amounts of private land ownership in the largest fish-bearing portions of the drainages (Upper West Branch and Lower West Branch), adfluvial cutthroat trout populations will likely be negatively affected as these private land owners continue to dike these stream channels and as brook trout populations increase. The effects of Alternative C will be no change in the existing conditions in Bismark, Binarch, and Priest River Face. In contrast, there will be a benefit at the stream segment scale in Priest Lake Face, Granite, Lamb, Quartz, and Lower West Branch. In addition, with the removal of approximately 1.4 miles of valley bottom road in Upper West Branch (while not building any new roads), the positive effects may start to be felt at the watershed level instead of the reach level. Because the actions only have effects at the stream reach scale, this project will have no incremental effect at the watershed scale. Although there is no cumulative effect of this project at the watershed scale, the overall effect of this project in combination with the past, present and reasonably foreseeable actions is to begin to improve habitat conditions so that populations of the MIS can begin to increase. The reason for this trend toward recovery is the watershed restoration opportunities that are presented through the harvest of approximately 5,000 acres of harvest. For the MIS species, this alternative has the greatest beneficial effect.

Consistency with Management Direction
Based on the information presented in this document this alternative would meet the Forest Plan as amended by the Inland Native Fish Strategy.

Table III-203. Effects to Management Indicator Species, ALTERNATIVE D.

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS (Positive Components)	DIRECT AND INDIRECT EFFECTS (Negative Components)
Priest Lake Face				X			In Area	Reduced Risk	
Granite				X				Increased Passage, Reduced Risk	
Bismark			X			X	X		
Lamb				X			X	Reduced Risk	temporary road building
Binarch			X				X		temporary road building
Upper West Branch				X			X	Increased Passage, Reduced Risk, reduced encroaching road	temporary road building
Priest River Face			X			X	X		temporary road building
Quartz				X			X	Reduced Risk, reduced encroaching road	temporary road building
Lower West Branch				X			X	Reduced Risk, reduced encroaching road	temporary road building

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no watershed has a strong population of cutthroat trout and only Granite has a known population of bull trout. Although some of the decline is related to land management actions (especially in Bismark, Upper West Branch, Lamb, Binarch, Priest River Face, Quartz, and Lower West Branch), part of the decline is the result of two introduced species; lake trout and brook trout. The population trend of cutthroat trout has been a rapid decline but now appears to be stabilizing or declining at a slower rate. Bull trout have declined to a point where there may only be several hundred adults in a basin where historically over 1,000 were caught by anglers each year. In watersheds with large amounts of private land ownership in the largest fish-bearing portions of the drainages (Upper West Branch and Lower West Branch), adfluvial cutthroat trout populations will likely be negatively affected as these private land owners continue to dike these stream channels and as brook trout populations increase. The effects of Alternative D will be no change in the existing conditions in Bismark, Binarch, and Priest River Face. In contrast, there will be a benefit at the stream segment scale in Priest Lake Face, Granite, Lamb, Upper West Branch, Quartz, and Lower West Branch. Because the actions only have effects at the stream reach scale, this project will have no incremental effect at the watershed scale. Although there is no cumulative effect of this project at the watershed scale, the overall effect of this project in combination with the past, present and reasonably foreseeable actions is to begin to improve habitat conditions so that populations of the MIS can begin to increase. The reason for this trend toward recovery is the watershed restoration opportunities that are presented through the harvest of approximately 7,400 acres of harvest.

Consistency with Management Direction

Based on the information presented in this document this alternative would meet the Forest Plan as amended by the Inland Native Fish Strategy.

Table III-204. Effects to Management Indicator Species, ALTERNATIVE E.

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS (Positive Components)	DIRECT AND INDIRECT EFFECTS (Negative Components)
Priest Lake Face				X			X		
Granite				X				Increased Passage, Reduced Risk	
Bismark			X			X	X		
Lamb				X			X	Reduced Risk	temporary road building
Binarch			X				X		temporary road building
Upper West Branch				X			X	Increased Passage, Reduced Risk, reduced encroaching road	temporary road building
Priest River Face			X			X	X		temporary road building
Quartz				X			X	Reduced Risk, reduced encroaching road	temporary road building
Lower West Branch				X			X	Reduced Risk, reduced encroaching road	temporary road building

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no watershed has a strong population of cutthroat trout and only Granite has a known population of bull trout. Although some of the decline is related to land management actions (especially in Bismark, Upper West Branch, Lamb, Binarch, Priest River Face, Quartz, and Lower West Branch), part of the decline is the result of two introduced species; lake trout and brook trout. The population trend of cutthroat trout has been a rapid decline but now appears to be stabilizing or declining at a slower rate. Bull trout have declined to a point where there may only be several hundred adults in a basin where historically over 1,000 were caught by anglers each year. In watersheds with large amounts of private land ownership in the largest fish-bearing portions of the drainages (Upper West Branch and Lower West Branch), adfluvial cutthroat trout populations will likely be negatively affected as these private land owners continue to dike these stream channels and as brook trout populations increase. The effects of Alternative E will be no change in the existing conditions in Bismark, Binarch, and Priest River Face. In contrast, there will be a benefit at the stream segment scale in Priest Lake Face, Granite, Lamb, Upper West Branch, Quartz, and Lower West Branch. Because the actions only have effects at the stream reach scale, this project will have no incremental effect at the watershed scale. Although there is no cumulative effect from this project at the watershed scale, the overall effect of this project in combination with the past, present and reasonably foreseeable actions is to begin to improve habitat conditions so that populations of the MIS can begin to increase. The reason for this trend toward recovery is the watershed restoration opportunities that are presented through the harvest of approximately 5,000 acres of harvest.

Consistency with Management Direction

Based on the information presented in this document this alternative would meet the Forest Plan as amended by the Inland Native Fish Strategy.

Table III-205. Effects to Management Indicator Species, ALTERNATIVE F.

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS (Positive Components)	DIRECT AND INDIRECT EFFECTS (Negative Components)
Priest Lake Face				X			X		
Granite				X				Increased Passage, Reduced Risk	
Bismark			X			X	X		
Lamb				X			X	Reduced Risk	temporary road building
Binarch			X				X		temporary road building
Upper West Branch				X			X	Reduced Risk, reduced encroaching road	temporary road building
Priest River Face			X			X	X		temporary road building
Quartz				X			X	Reduced Risk, reduced encroaching road	temporary road building
Lower West Branch				X			X	Reduced Risk	temporary road building

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no watershed has a strong population of cutthroat trout and only Granite has a known population of bull trout. Although some of the decline is related to land management actions (especially in Bismark, Upper West Branch, Lamb, Binarch, Priest River Face, Quartz, and Lower West Branch), part of the decline is the result of two introduced species; lake trout and brook trout. The population trend of cutthroat trout has been a rapid decline but now appears to be stabilizing or declining at a slower rate. Bull trout have declined to a point where there may only be several hundred adults in a basin where historically over 1,000 were caught by anglers each year. In watersheds with large amounts of private land ownership in the largest fish-bearing portions of the drainages (Upper West Branch and Lower West Branch), adfluvial cutthroat trout populations will likely be negatively affected as these private land owners continue to dike these stream channels and as brook trout populations increase. The effects of Alternative F will be no change in the existing conditions in Bismark, Binarch, and Priest River Face. In contrast, there will be a benefit at the scale of a stream segment in Priest Lake Face, Granite, Lamb, Upper West Branch, Quartz, and Lower West Branch. Because the actions only have effects at the stream reach scale, this project will have no incremental effect at the watershed scale. Although there is no cumulative effect from this project at the watershed scale, the overall effects of this project in combination with the past, present and reasonably foreseeable actions is to begin to positively alter habitat conditions so that populations of the MIS can begin to increase. The reason for this trend toward recovery is the watershed restoration opportunities that are presented through the harvest of approximately 4,000 acres of harvest.

Consistency with Management Direction

Based on the information presented in this document this alternative would meet the Forest Plan as amended by the Inland Native Fish Strategy.

Table III-206. Effects to Management Indicator Species, ALTERNATIVE G .

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS (Positive Components)	DIRECT AND INDIRECT EFFECTS (Negative Components)
Priest Lake Face				X			X	Reduced Risk	
Granite				X				Increased Passage, Reduced Risk	
Bismark			X			X	X		
Lamb				X			X	Reduced Risk	
Binarch			X				X		
Upper West Branch					X		X	Increased Passage, Reduced Risk, reduced encroaching road	
Priest River Face			X			X	X		
Quartz				X			X	Reduced Risk, reduced encroaching road	
Lower West Branch				X			X	Increased Passage, Reduced Risk, reduced encroaching road	

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently no basin has a strong population of cutthroat trout and only Granite has a known population of bull trout. Although some of the decline is related to land management actions (especially in Bismark, Upper West Branch, Lamb, Binarch, Priest River Face, Quartz, and Lower West Branch), part of the decline is the result of two introduced species; lake trout and brook trout. The population trend of cutthroat trout has been a rapid decline but now appears to be stabilizing or declining at a slower rate. Bull trout have declined to a point where there may only be several hundred adults in a basin where historically over 1,000 were caught by anglers each year. In watersheds with large amounts of private land ownership in the largest fish-bearing portions of the drainages (Upper West Branch and Lower West Branch), adfluvial cutthroat trout populations will likely be negatively affected as these private land owners continue to dike these stream channels and as brook trout populations increase. The effects of Alternative G will be no change in the existing conditions in Bismark, Binarch, and Priest River Face. In contrast, there will be a benefit at the stream segment scale in Priest Lake Face, Granite, Lower West Branch, and Quartz. In addition, with the removal of approximately 1.4 miles of valley bottom road in Upper West Branch (while not building any new roads), the positive effects may start to be felt at the watershed level instead of the reach level. Because the actions only have effects at the stream reach scale, this project will have no incremental effect at the watershed scale. Although there is no cumulative effect of this project at the watershed scale, the overall effect of this project in combination with the past, present and reasonably foreseeable actions is to begin to improve habitat conditions so that populations of the MIS can begin to increase. For the MIS species, this alternative has the greatest beneficial effect.

Consistency with Management Direction

Based on the information presented in this document this alternative would meet the Forest Plan as amended by the Inland Native Fish Strategy.

Comparision of Alternatives for Benefits to Fish

Comparison of alternatives is based on the the relative effects to fish-bearing streams from watershed restoration activities, temporary road construction, harvest and associated fuels reduction (as related to risk of catastrophic fire). Overall, alternative C potentially has the most benefit for fisheries because it completes watershed restoration and some reduction of catastrophic fire risk without adding risk to fish by building temporary roads. Alternative G would have slightly less benefit than alternative C because although there would be no road construction and equal watershed opportunities, there would potentially be a higher risk of catastrophic fire which could be detrimental to riparian areas. Alternative B is slightly more beneficial than alternatives D or E because there is slightly less temporary road construction. Alternative D and alternative E have equal potential effects and would likely be less beneficial to fish-bearing streams than alternatives G and C because of temporary road building. Alternative F has among the least potential benefit to fish-bearing streams because it has less watershed restoration opportunities than the other action alternatives but contains temporary road construction. Alternative A would be the worst for fish-bearing streams because, although there would be no temporary road construction, there would not be any watershed restoration and it contains the highest risk for catastrophic fire. All action alternatives would reduce the long-term risk to MIS species, threatened species, and sensitive species.

Effects of Opportunities

Additional watershed restoration projects (such as road obliteration, removal or improvement of stream crossing and placement of instream structures to benefit fish habitat) have the opportunity to be funded with this project. These projects would result in the short-term increase in sediment but in the long-term would benefit the MIS.

Treatment of weeds would have no effect on the MIS when treatments follow standards within the design criteria that minimize risk to riparian vegetation and aquatic species.

Timber stand improvement would have no effectwhen conducted outside stream buffers.

Consistency with the Forest Plan and Other Applicable Regulatory Direction

Based on the information presented in this document, the alternatives would meet the Forest Plan as amended by the Inland Native Fish Strategy as well as other laws intended to maintain or restore fish populations.

FUELS AND FIRE BEHAVIOR

CHANGES BETWEEN THE DRAFT AND FINAL EIS

In response to comments and in recognition of errors in the Draft EIS, the Final EIS has changes in the fuels and fire behavior section. A brief summary of the changes are as follows: The Affected Environment section of the Priest Lake project area has been expanded to better describe the historic conditions and the actions that led to current forest health problems. Additional analysis was completed for the Final EIS. The Forest Vegetation Simulator (FVS) was used. The Fire and Fuels Extension (FFE-FVS) integrates FVS with elements from existing models of fire behavior and fire effects. Model output displays fuels, stand structure, snags, and potential fire behavior over time and provides a basis for comparing proposed fuel treatments. Many wording and other editing changes have taken place to further clarify the descriptions of information provided. Alternatives F and G have been added and analyzed in response to comments. There is expansion on the description of cumulative effects, foreseeable actions, and opportunities.

REGULATORY FRAMEWORK

The IPNF Forest Plan objective is to implement efficient fire protection and use programs based on management objectives, site specific conditions, and expected fire occurrence and behavior. Fire management plans are to be guided by the following standards:

- *Management area standards and goals provide direction for appropriate response.*
- *Human life and property will be protected.*
- *The appropriate suppression response for designated old-growth stands in all management areas except in wilderness will result in prevention of old growth loss.*
- *Activity fuels will be treated to reduce their potential rate of spread and fire intensity so the planned initial attack organization can meet initial attack objectives.*

The primary Forest Plan Management Areas within the Priest Lake Beetle Project Area include goals to manage suitable lands for timber production for the long-term growth and production of commercially valuable wood products. The fire protection standard to achieve that goal is to use initial attack strategies (confine, contain and control) appropriate to achieve the best benefit based on commercial timber values and where appropriate, big-game winter range values.

Forest Service Manual (FSM) 5105, defines fuel as combustible wildland vegetative materials, living or dead. Agency direction is to evaluate, plan and treat wildland fuel to control flammability and reduce resistance to control including mechanical, chemical, biological, or manual means (FSM 5150). This includes the use of prescribed fire to support land and resource management objectives.

The objectives of fuels management are to:

- *Reduce fire hazard to a level where cost effective resource protection is possible should a wildfire ignition occur. Fire hazard is the potential fire behavior (intensity and rate of spread) of a fire burning in a given fuel profile and its ability to be suppressed by firefighting forces.*

- *Reduce the potential fire severity.*

Fire suppression policy from the early 1900's until the late 1970's has been that of total suppression. Only recently has fire policy been modified to recognize the importance of fire in balancing vegetation cycles within the temperate forest. The Federal Wildland Fire Management Policy and Program Review was chartered by

the Secretaries of the Interior and Agriculture to examine the need for modification of and addition to Federal fire policy. The review recommended a set of consistent policies for all Federal wildland fire management agencies. In adopting the policy, the Federal Agencies recognized that wildfire has historically been a major force in the evolution of our wildlands, and it must be allowed to continue to play its natural role wherever possible. It was also recognized that all Agencies will not necessarily employ all identified procedures on all administrative units at all times (USDI, USDA, 1995; USDI, USDA, 1996). The severe wildfire seasons in northern California and Oregon in 1987, in Yellowstone Park, and the Northern Rocky Mountains in 1988, throughout much of the West in 1994, and Florida and Texas in 1998 have made it clear that fire cannot be excluded from fire-dependent ecosystems. On the other hand, because of developed areas, and commercial forests, fire cannot be fully restored to its historic character, except perhaps in a few of the largest wilderness areas (USDA, 1996.)

AFFECTED ENVIRONMENT

Fire is the major disturbance factor that produces vegetation changes in our ecosystems. If the role of fire is altered, or removed, this will produce significant changes in the ecosystem. Fire has burned in every ecosystem and virtually every square meter of the coniferous forests and summer-dry mountainous forests of northern Idaho, western Montana, eastern Washington and adjacent portions of Canada. Fire was responsible for the widespread occurrence and even the existence of western larch, lodgepole pine, and western white pine. Fire maintained ponderosa pine throughout its range at the lower elevations and kills ever-invading Douglas-fir and grand fir (Spurr and Barnes 1980). Many ecosystems are regularly recycled by fire; life for many forest species literally begins and ends with fire. The effects of the historic disturbance factors, mostly associated with fire, and their current absence are discussed in more detail the Vegetation Section.

In the discussion that follows "severity" refers to the amount of damage a fire actually causes and "return interval" refers to how often a particular type of fire occurs. Here is a summary of the types of fires that occur in forested ecosystems:

- **Nonlethal fires** - fires that kill 10% or less of the dominant tree canopy. A much larger percentage of small understory trees, shrubs and forbs may be burned back to the ground line. These are commonly low severity surface and understory fires, often (but not always) with short return intervals (few decades).

- **Mixed severity fires** - fires that kill more than 10%, but less than 90% of the dominant tree canopy. These fires are commonly patchy, irregular burns, producing a mosaic of different burn severities. Return intervals on mixed severity fires may be quite variable.

- **Lethal fires** - fires that kill 90% or more of the dominant tree canopy. These are often called "stand replacing" fires and they often burn with high severity. They are commonly (but not always) crown fires. In general (but not always), lethal fires have long return intervals (140-250+ years apart), but affect large areas when they do occur. Local examples of these types of fires would be the Sundance and Trapper Peak fires of 1967 that burned over 80,000 acres in a relatively short time period during late summer drought conditions.

Lower and middle slopes of the Priest River Basin historically had a variable severity fire regime with lots of topographic control (Arno, Stephen F. and Davis, Dan H. 1980). Approximately 86 percent of the project area consists of cedar and hemlock forest types. Historic fire regime in these types was variable, with long interval large lethal fires mixed with shorter return interval non lethal and mixed severity fires (USDA 1997a). The remaining 14 percent of the project area consists of dry forest types scattered among larger areas of moist types. Data collected on the IPNF suggests that the historic fire return interval on the Idaho Panhandle and Colville National Forests is highly variable (Zack and Morgan 1994). Data from Priest Lake on small isolated dry sites indicate a fire return interval of approximately 60 years (IPNF SO lobby display).

The fire history analysis of the Coeur d'Alene Basin conducted by Zack and Morgan in 1994 drew the following conclusions that are also applicable to other forests with similar fire regimes such as the Priest River Basin:

- In addition to cycling carbon and nutrients, the infrequent large lethal fires played a dominant role in resetting the successional sequence and structuring the vegetation matrix across the landscape. However, the nonlethal and mixed severity fires were also important. Most stands (within the Coeur d'Alene Basin) apparently experienced an average of one to three of these low severity burns between lethal fires. These lower severity fires would reduce ground fuels, reduce ladder fuels, thin stands, and favor larger individuals of fire resistant species (larch, Douglas-fir, and ponderosa pine), than if these mixed severity and nonlethal fires had not occurred.

- Lower severity fires structured how the landscape responded when a lethal severity fire did occur. The lower severity fires increased the proportion of the landscape with big trees and open canopies that would not sustain a crown fire. Reduction of ladder fuels would mean that even high intensity fire might not reach tree canopies in some cases. The larger trees that grew as a result of the thinning would be more likely to survive even intense fires. The net result would be that even mostly lethal severity fires would be likely to leave more individual residual trees and patches of residual trees than if the lower severity fires had not occurred. The effects of lethal fire events would be less uniform as a result of the lower severity fires

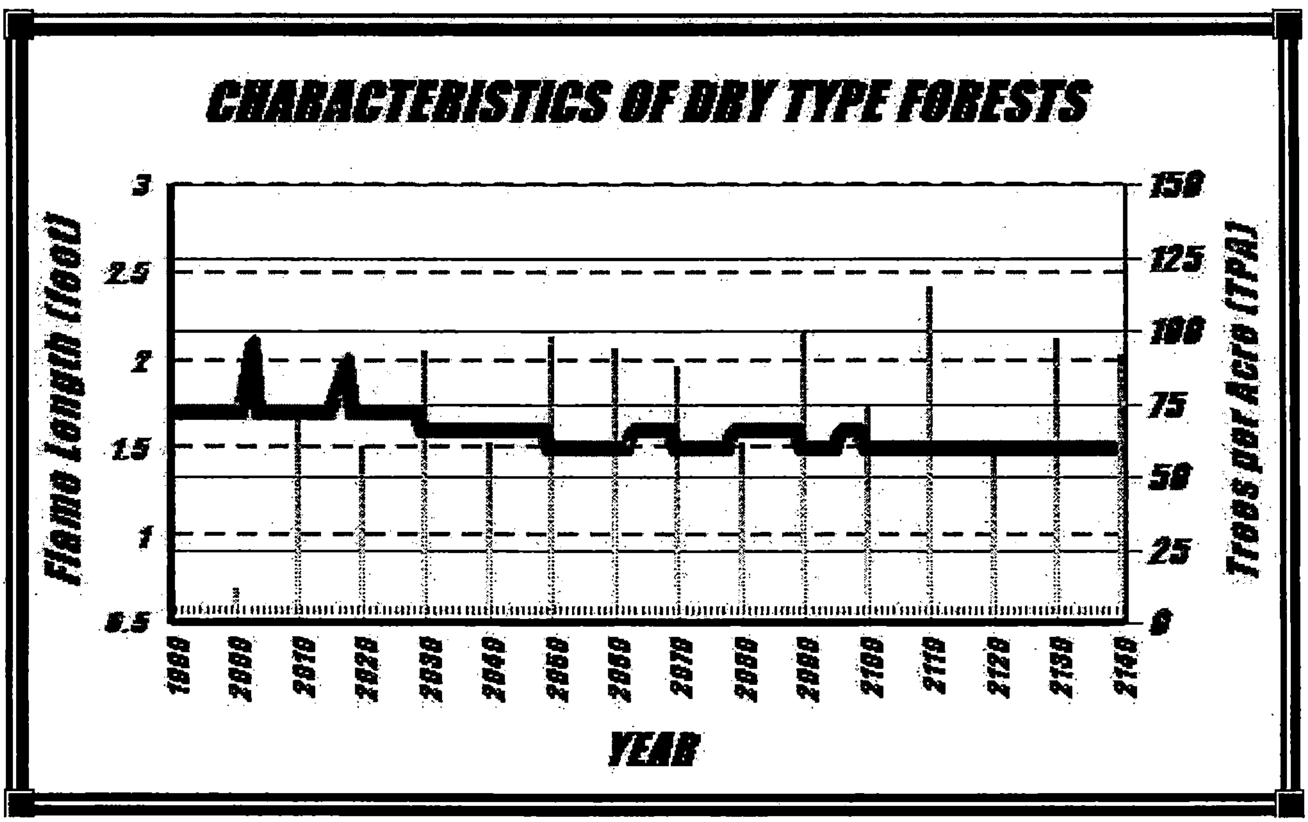
- Regional climate change operating on the scale of decades and centuries may be implicated in the major fire patterns observed. The historical record shows that some relatively recent fires were quite large. In particular, the 1919, 1910, and 1889 burns were very large and severe both in the Coeur d'Alene Basin and throughout the Northern Rocky Mountains. Other dates such as 1542, 1738, 1764, 1772, 1814, 1830, and 1859 appear to be regional episodes. This strongly suggests that regional climate patterns are responsible for many of the major fire episodes on the Coeur d'Alene.

There are several reasons for the departure from historic stand structure now evident in the Priest Lake basin. Timber harvesting began in the 1890's. Ponderosa pine, white pine and cedar were most valuable, larch and Douglas-fir were used for railroad ties and mine timbers. By 1900 a major portion of mature ponderosa pine stands had been harvested and either converted to other uses or were regenerating to dense, often mixed species stands. Prior to 1960 many upland areas were high-grade logged removing only the valuable species, resulting in major stand conversions to grand fir, hemlock, and Douglas-fir. Accounts of early day logging are presented in greater detail in the vegetation section of the FEIS. Since the late 1930's, fire control efforts have become effective. The primary impact of fire control has been to eliminate underburns and mixed severity fires which served as the thinning agents that favored larch and ponderosa pine. These mixed severity fires also generated some large fuels, and did not occur frequently enough to maintain open understories across large landscapes. Overall, in northern Idaho and eastern Washington, moist habitat types tended to be a mosaic of forest stand structures and densities, but dense stands were common. In 1909 white pine blister rust was accidentally introduced to western North America. This Eurasian disease devastated white pine forests (Zack, 1995). With the lack of thinning described above, western larch starts a rapid decline by age 80 and ponderosa pine by age 130 (USDA 1994, PNW-GTR-320). These cumulative effects of 100 years of past activities have created large amounts of young stands comprised of tolerant species.

The changes that have occurred to western warm dry forests have been well documented. With effective exclusion of underburning in this century, warm dry forests quickly became overstocked, often exceeding carrying capacity. In the absence of fire, native insects and pathogens regulate stocking by killing susceptible individuals and species. Frequent underburning also prevented excess accumulation of carbon and nutrients in woody biomass. The balance between fire and biological decomposition in regulating carbon accumulations in these forests has been disrupted. A current danger is stand replacing wildfire with fuel accumulations so high that burns are extremely hot, resulting in critical reductions of stored nutrients, with accompanying loss in potential productivity. The effectiveness of fire prevention and suppression has

permitted increased ground fuel accumulations and stratified fuels (both living and dead) to the point where many fires can not be contained or confined. They now burn hotter and more extensively than even 10 years ago. This affect has been especially evident in dry forests that historically burned frequently (Harvey, 1984). Data collected on the IPNF suggests that the historic fire return interval on the Idaho Panhandle and Colville National Forests is highly variable on dry sites (Zack and Morgan 1994). Data from Priest Lake on small isolated dry sites indicate a fire return interval of approximately 60 years. On the Bonners Ferry Ranger District, fire return intervals were approximately 25 years on Hall Mountain dry sites (data in the Fuels/Fire section of the Project File). The figure below displays modeled simulations of the effects a 20 year fire return interval could have on a typical old-growth ponderosa pine forest. Values displayed represent potential flame lengths over time should a wildland fire occur, and the number of trees per acre that could occupy the site over time. Predictions were made using the FFE-FVS model, described later under Environmental Consequences, "Methodology" section.

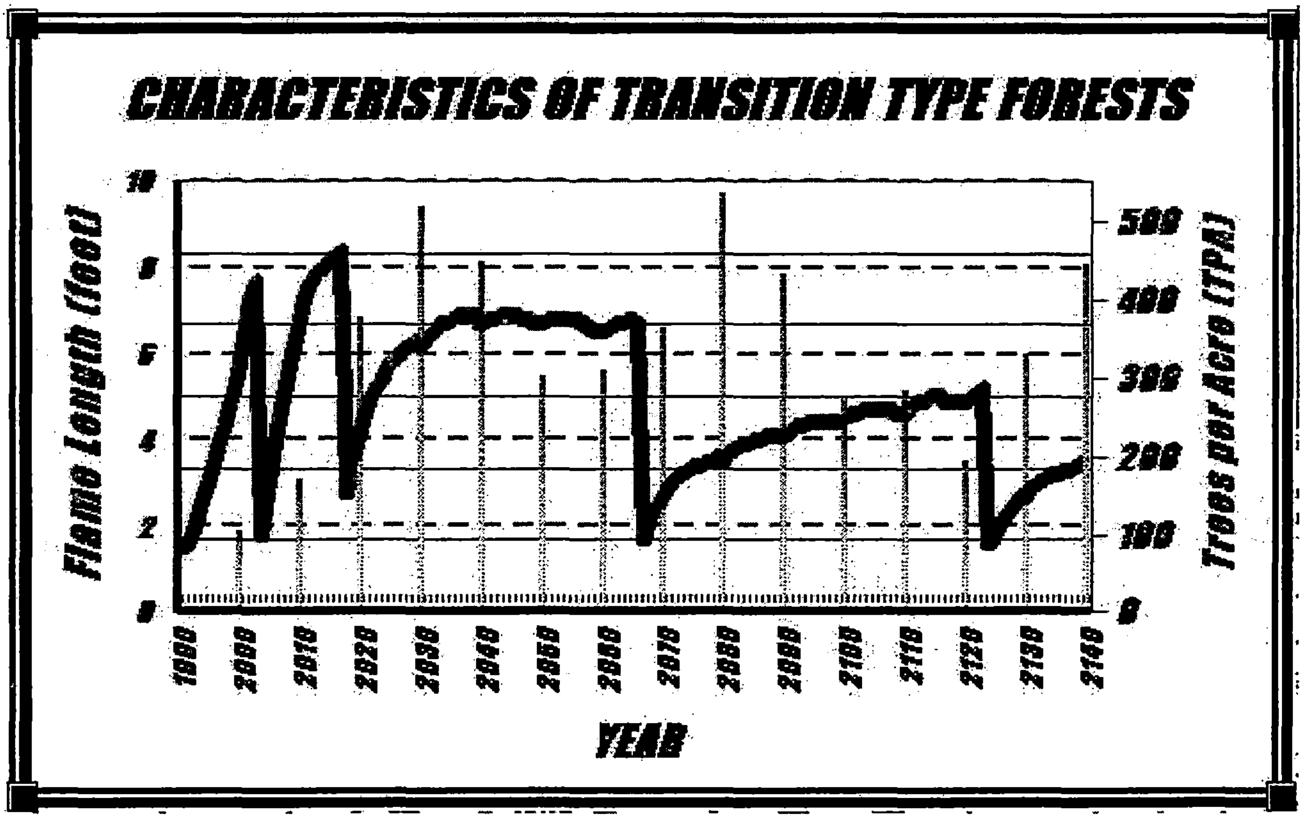
Figure III-10. Modeled simulations of the effects of a 20-year fire return interval on a typical old-growth ponderosa pine forest.



In contrast with warm, dry forests, biological decomposition in warm, moist forest is substantial and the role of fire in nutrient cycling is reduced. Conversion of tall, well-spaced white pine forests to low, densely stratified Douglas-fir and true fir forests results in hazardous fuel ladders. Transition forests (warm, dry to warm, moist) possess most of the features of both dry and moist forests. Landscapes were historically a complex patchwork of stands resulting from fires that produced both lethal and nonlethal effects. Due primarily to the influences of fire exclusion and selective logging, as previously discussed, modern day transition forests are far more homogeneous than historical forests. Loss of landscape diversity is primarily associated with increasing dominance and layering of shade-tolerant species in stands previously dominated by open-growing ponderosa pine or other seral species. On areas that transition to moist forest types, the historic forest species composition was mixed with pines and larch playing a more dominant role than that of

today. Mixed severity fires are now an improbable occurrence in many transition forests (Harvey, et.al. 1995, USDA 1999). Data collected on the IPNF suggests that the historic fire return interval on the Idaho Panhandle and Colville National Forests is highly variable (Zack and Morgan 1994). On the Bonners Ferry Ranger District, fire return intervals in transition forests ranged from approximately 23 to 63 years on Hall Mountain and Skin Creek transition sites (data in the Fuels/Fire section of the Project File). The figure below displays modeled simulations of the effects a 50 to 60-year fire return interval could have on a mixed species forest over a 140-year time period. Values displayed represent potential flame lengths over time should a wildland fire occur, and the number of trees per acre that could occupy the site over time.

Figure III-11. Modeled simulations of the effects of a 50 to 60-year fire return interval on a mixed species forest over a 140-year period.



Although increases in volume and stocking are not as evident in moist forests as in dry and transition forests, some excessive fuel buildups have developed. Fuel accumulations associated with blister rust mortality can be substantial, and increasing accumulations of dead Douglas-fir and true firs associated with root disease mortality is expected. Additionally, conversion of tall, well spaced white pine to low, densely stratified fir results in hazardous fuel ladders. Thus, significant changes in fire behavior are also a characteristic of modern-day, moist interior forests. Such changes in fire behavior threaten future fire control and place neighboring forest ecosystems at risk (Harvey, 1984).

A significant change from common historic patterns is indicative of unhealthy conditions. Application of this concept to most north temperate and boreal forests characteristic of the western interior of the United States suggests many are unhealthy, especially where historical fire regimes have been significantly interrupted (Harvey,1984, US GAO, 1999a and 1999b). The GAO report and testimony address the extent and seriousness of problems related to the health of national forests in the interior West, the status of efforts by the Department of Agriculture's Forest Service to address the most serious of these problems, and barriers to successfully addressing these problems and options for overcoming them.

Currently, fire occurrence on the Idaho Panhandle National Forest averages 163 fires per year, with a burned acreage average of 665 acres (IPNF annual fire reports; Fire Stat Database). With the exception of the Sundance and Trapper Peak fires in 1967, fires on the Idaho Panhandle since 1931 have not been to the same scale as historic fires.

On particular sites where there have been weather and insect related disturbances, we are accumulating fuel. The same types of disturbances under historic conditions would have led to similar fuel accumulations. Historically, that was often a precursor to stand replacing fires that followed when suitable weather conditions presented themselves (Spurr and Barnes, 1980).

The Idaho Panhandle National Forest Draft Wildfire Prevention Plan, completed in 1998, evaluated areas of the Idaho Panhandle National Forest as they pertain to wildfire risk. The major components in this evaluation included fire history, fuels, topography and values at risk. For the Priest Lake face area, the results of this evaluation determined the wildfire risk was high, as it relates to the annual average number of years, high, as it relates to current fuel accumulations and high, to values at risk. The remaining Douglas-fir beetle areas ranged from moderate to high for Risk and Hazard and Low to high for Value at risk. Opportunities to mitigate these risks are available with prescribed fire and mechanical fuels treatment adjacent to private ownership.

ENVIRONMENTAL CONSEQUENCES

Methodology

Of primary concern to fuels management is the long-term fuel loading increase and subsequent changes in fire intensity and severity that may occur as a result of the Douglas-fir beetle outbreak. A team of specialists was convened on the IPNF to assess the Douglas-fir beetle epidemic. The "Outbreak Incident" Assessment team was brought together to assess the magnitude of the outbreak to date, project its future behavior, and develop both short and long-term strategies for treatment. A report documents the Assessment Team's findings and recommendations (USDA,1998c). The purpose of the Fuel Loading analysis conducted for the broadscale assessment was to project the total additional fuel tonnage, on a per acre basis, that could potentially be made available in stands where there is potential for Douglas-fir beetle mortality.

Site specific analysis done for the DEIS followed the same process outlined in the report, but instead was based on the actual observed and predicted extent of mortality to determine the potential increase in fuel loading and the number of snags created per acre (detailed results are located in the Fuels/Fire section of the Project File). The total tonnage of fuel that would be removed throughharvest was calculated for each alternative, results are documented in the fire/fuels section of the project file. Ten-year old Douglas-fir bark beetle areas were studied and fuel surveys were completed as a check of assumptions made in the outbreak assessment report. Those findings and the analysis process were documented in a report (USDA,1998a). Based on comments received on the DEIS, additional analysis was completed for the FEIS. For this additional analysis, stands were selected from those used in the fuel accumulation analysis. The analysis was conducted to determine differences in potential fire intensities and severities that could result from different management strategies. A sample of stands was selected that represent the full range of habitat type groups and a full range of predicted fuel load increases within the area due to the beetle infestation.

The Forest Vegetation Simulator (FVS), widely used by forest managers throughout the United States and Canada to predict the effects of various vegetation management actions on future forest conditions was used for this additional analysis. The Fire and Fuels Extension to FVS (FFE-FVS) integrates FVS with elements from existing models of fire behavior and fire severity. Model output displays fuels, stand structure, snags, and potential fire behavior over time and provides a basis for comparing proposed fuel treatments (USDA, 1998b; USDA 1997c). A full description of the model is contained in the Fuels/Fire section of the Project File .

The most recent Douglas-fir beetle outbreak on the Idaho Panhandle National Forest occurred in 1987 and 1988 on the Coeur d'Alene River and St. Joe River Ranger Districts. Three of these sites in the Eagle Creek Drainage on the Coeur d'Alene River Ranger District were studied to determine the fuel loading potential from killed trees and the amount of fuel on the ground and available for wildfire (survey results and documentation are located in the Fuels/Fire section of the Project File).

At these sites, approximately one quarter of the available fuel (from beetle killed trees) was on the ground. The limbs over one inch were still sound, tree boles were suspended above the ground and still provided sound fuels. Fuels less than one inch were mostly absent due to decay. Regeneration of tolerant species was starting to occur. There were more fine live fuels, grass and low brush, present in the open areas than under the adjacent timber canopies. Sufficient grass was available in some locations to carry a fire. Existing fuel loadings were determined by conducting fuel survey transects in the selected beetle kill centers. Transects were designed consistent with protocol established by Brown (1974) and Jain (1998). The total estimated potential fuel loading from beetle killed trees at these sites ranged from 72 to 122 tons per acre, the average existing down woody fuel loading varied from 28 to 47 tons per acre.

Vegetation and fuels conditions will change over time as a result of the Douglas-fir beetle infestation. Stand succession in these areas can be predicted based on observations noted above and trends documented in the Outbreak Incident Assessment (USDA, 1998c). Changes in stand structure and forest fuels will go through several stages. Tools are available to measure the effect of these changes on wildfire should one occur. The Forest Vegetation Simulator (FVS) was one tool used for this analysis. Full description of the model, input and output tables for all stands analyzed, and graphs that show the range of outputs for stands analyzed are contained in the Fuels/Fire section of the Project File .

Fire behavior depends on forest density, composition, amount of surface fuel, its arrangement, moisture content, prevailing weather, and physical setting. To characterize surface fire behavior, 13 fire behavior fuel models are available that describe the fuel complex, fuel loading, fuel bed depth, and moisture of extinction (upper limits of fuel moisture beyond which a fire will no longer spread with a uniform burning front) in dead and live fuels for grass, shrub, timber, and logging slash groups. These models in combination with dead and live fuel moisture content, slope angle, and wind speed provide a basis for predicting both fire spread rate and intensity (USDA, 1999a).

Fire spread rates and intensities can be predicted for various fuel types using the BEHAVE model. BEHAVE is an interactive computer system designed to predict or estimate fire behavior characteristics needed for fire management purposes. It is composed of the latest state-of-the-art simulation models developed for fire and associated fuel and environmental parameters. BEHAVE has evolved over several years in conjunction with the material developed for training fire behavior officers at the National Advanced Resource Technology Center in Marana, Arizona. The parameters that the Douglas-fir beetle will affect are the fuel models, as affected timber stands go through successional changes, fuel models that describe how a fire would react within the stand would also change.

Although fire was a significant disturbance on the landscape, its intensity and severity was variable as discussed above. It is important to separate fireline intensity from fire severity. Intensity is the energy release rate per unit length of fireline, and is a physical parameter that can be related to flame length. It can be determined from the product of biomass consumption (energy) and rate of spread of the fire. Fire severity is an ecological parameter that measures, albeit somewhat loosely, the effects of the fire. Two fires of the same fireline intensity can have quite different effects between an old-growth mixed-conifer forest and a young plantation of similar species because the smaller plantation trees will be more easily scorched and have thinner bark. The fire in the old-growth may be of low severity while the plantation fire is of high severity. Land managers are generally more interested in fire severity, but must approach severity first by estimating fireline intensity and then using models such as FOFEM to predict tree mortality from fireline intensity (Agee, J.K. 1996).

Approximately 5 years following the beetle infestation, Douglas-fir snags would contain sufficient rot in the top third of the tree that would burn off in a few hours (Harvey and Wright, 1967). Federal Wildland Fire Management Policy is to provide for firefighter and public safety as one of the first priorities. The deaths of 34 firefighters in 1994 focused the fire community's attention on wildland fire, and resulted in numerous initiatives at the federal and state levels to improve firefighter safety. One such study was conducted on wildland fire fatalities in the United States between 1990 to 1998 (USDA Forest Service, 1999b) "Falling snags (dead standing trees without leaves or needles in the crowns) killed four wildland firefighters. Although this hazard has resulted in relatively few deaths, and none have occurred in the past four years, the risk of death or injuries from falling snags remains a serious concern. The deterioration of forest health in the western United States has resulted in enormous areas of forested land becoming susceptible to wildfire. Snags typically have much lower fuel moistures than live green trees and burn more readily. In the process, they often throw spot fires far in advance of the main fire, and often burn through more quickly than green trees, falling with little or no warning. The risk of injuries from falling snags increases during the night operational period when visibility is greatly reduced. While the cooler night time period is generally a more effective time to gain control on wildfires, the increased risk from unseen falling snags may limit the widespread use of crews at night in areas of dead and dying timber." Firefighters need to be aware of the dangerous and often life threatening conditions that falling trees and snags can create during all aspects of firefighting in forested areas. In fact, falling trees and snags are one of the leading causes of death and injury for wildland firefighters (Valdez, M. and Style J.R. 1996).

Where larger fires involve numerous snags per acre, a serious safety hazard exists. In such cases, because of increased safety awareness, it has become common practice for the firefighters to back away from a fires edge a sufficient distance to allow time to create a safe work environment to construct, burn out, and hold fire lines. This form of fire fighting is often referred to as "indirect attack". Indirect attack often results in more acreage burned and especially in timber types, an increased risk of escaped fire.

Direct, Indirect and Cumulative Effects

Direct and Indirect Effects Common to All Alternatives

Once forest canopies are opened, structural changes begin to take place in the surface vegetation. As more sunlight reaches the ground, more grass and brush species can grow and conifer regeneration begins. Fuel models used for estimating fire behavior would also change. Stands reviewed on the Idaho Panhandle National Forest (USDA 1998a), ten years following a Douglas-fir beetle infestation went through the expected surface fuel changes. In adjacent portions of the stands that were unaffected by the Douglas-fir beetle, the stands represented fuel models 8 and 10, closed canopy timber stands. Fire in the portions of these stands affected by the Douglas-fir beetle would now react as a shaded grass fuel model (model 2) or a brush model (model 5 or 6). This condition would last for several years. Rates of spread would increase compared to a model 8 or 10 (please refer to the table below). Since the stands would be more open, atmospheric conditions would have more effect on the fuel, fuels would dry quicker and more wind could penetrate the forest canopy to fan flames.

Trees that are killed by the beetle will stand for several years and therefore will not immediately become available ground fuel that would influence fire activity. By 15 years all branches and large limbs will have fallen, approximately 50 percent of the snags will have fallen also; greater than 90 percent of the snags will fall within 35 years (USDA, 1998b). The fuel accumulation rate will far exceed the decay rate for several decades. Decay rates for material greater than 3 inches in diameter can be expected to be near 1.5 percent per year; decay rates for limbs in the 1 to 3 inch size class should be near 9 percent per year (USDA 1998b). In affected stands, within 10 to 15 years, fuel conditions will start to resemble a fuel model 10, a timber stand with heavy down material and fuel ladders that enable a surface fire to climb into the crowns or a fuel model 11 or 12, a stand with heavy debris or often referred to as a slash model. Since the stands would still be fairly open and contain more grass and brush or regeneration than a dense timber stand, spread rates may

resemble a grass or brush model while intensities may start to resemble that of a fuel model 10, 11, or 12. These conditions are similar to those found by Leiberg (Leiberg, 1897) that historically contributed to severe stand replacing fires in the Coeur d'Alene basin.

Table III-207. Estimated rate of fire spread.

Fuel Model	Rate of Spread (chains per hour) normal/drought	Flame Length (feet) normal/drought
2	25/32	5.3/6.3
5	11/27	3.4/6.7
6	28/34	5.6/6.4
8	2/2	1.0/1.2
10	7/10	4.5/5.7
11	6/7	3.4/3.7
12	13/15	7.9/9.0

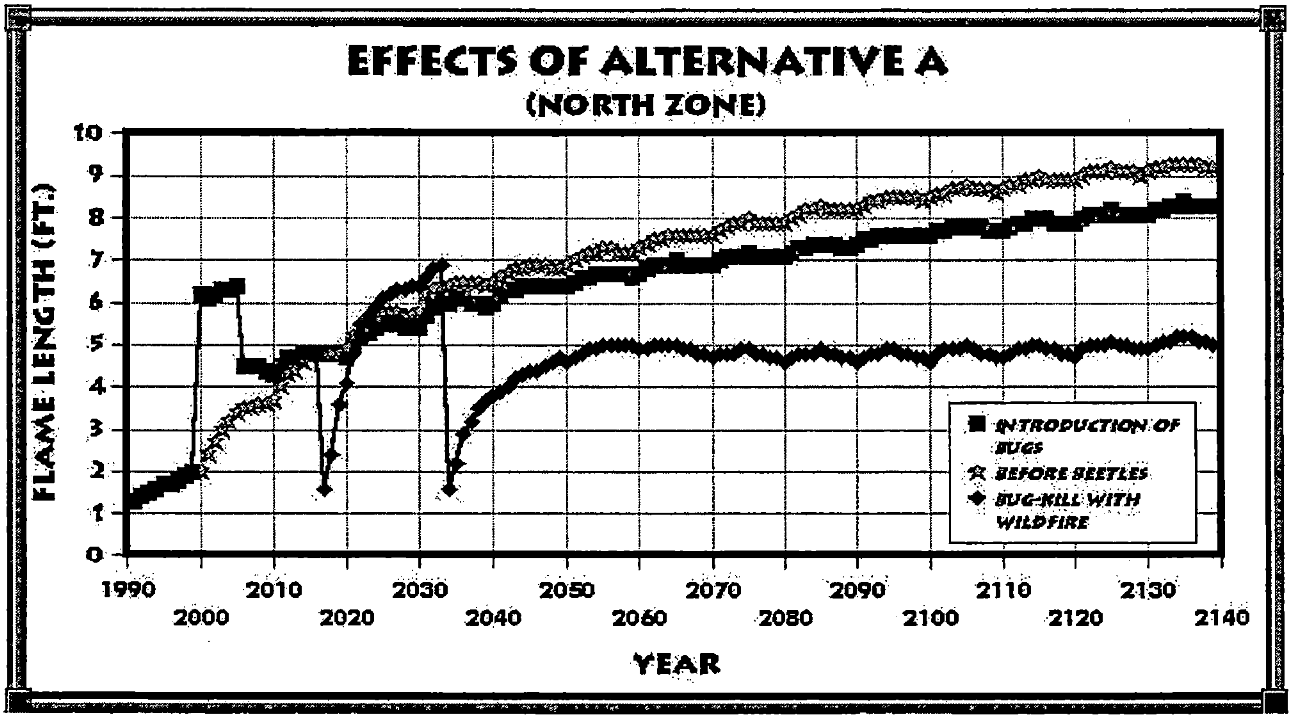
Values in the table were predicted using the BEHAVE model and constant weather and fuel moisture conditions to show changes in fire behavior as fuel models change. Two sets of values were used for calculations. The first set represents fuel conditions commonly found during normal summers in the inland Northwest and the second set represents fuel conditions commonly found during drought conditions (NWCG, 1992). The differences between a fuel model 8 and a grass model 2 or brush model 5 or 6 is even more pronounced during drought conditions. The definitions for values displayed on the above table are:

> ***Rate of spread.*** *Forward rate of spread of the fire, expressed in chains per hour. One chain equal 66 feet.*
>
> ***Flame Length.*** *The distance measured from the tip of the flame to the middle of the flaming zone at base of the fire, is valuable in determining type of resources necessary to fight fire by direct attack methods. Hand crews can normally suppress fires with flame lengths up to 4 feet, equipment is necessary when flame lengths are between 4 and 8 feet , aerial support is needed for fires with flame lengths up to 11 feet. Direct attack is not effective on fires with flame lengths over 11 feet.*

Alternative A (No Action)

Alternative A is the No Action Alternative, under which there would be no change from current management direction or from the level of management intensity in the area. Timber harvest, reforestation, watershed rehabilitation, and road obliteration activities, in connection with the Douglas-fir beetle infestation, would not be initiated at this time. The effects analysis reflects existing conditions and the anticipated effects of the Douglas-fir beetle infestations if no actions are taken.

Figure III-12. Predicted effects of a natural process of fuel accumulation and change prior to the beetle infestation (No-Action Alternative), effects of fuel conditions created by the beetle infestation, and effects of beetle-related fuel accumulation and wildfire.



The figure above displays the results of the FFE-FVS model outputs for one stand on the Priest Lake District. These results are typical for stands modeled and represent a mid range effect (Reinhardt, 1999). As depicted, fuel loadings and flame lengths of a wildfire would be expected to increase over time as a forested stand matures and surface fuels accumulate faster than the decay rate. Because of the bark beetle induced changes in stand structure, these changes would occur at an accelerated rate. The immediate effect would be for increased wind penetration into forested stands, which in the event of a fire start, would increase flame lengths and rates of spread. In successive years, the model depicts the effects of surface fuel loading changes as portions of limbs and tops from the beetle killed trees fall to the ground. As the dead fuel accumulation from the beetle killed trees slows, increases in regeneration provide fine fuels necessary to maintain flame lengths and spread rates. Intuitively, fire professionals know that heavy fuels increase flaming and smoldering time periods, thus increasing severity, even though the existing generation of fire behavior models do not account for this characteristic (Reinhardt, pers. comm, 1999).

The trends displayed in the above figure represent effects of a natural process of fuel accumulation and change in stand structure over time. Similar changes in ecosystem structure in the past have undoubtedly contributed to the fires, from lethal stand replacing to low severity underburns, that recycled inland ecosystems. However, prolonged buildup of fuel may eventually lead to fires more catastrophic and destructive to the site than typically occurred in the native forest. Where the disturbance regime was repeated, the historic fuel loading and potential flame length pattern for ecosystem fires would have been erratic, similar to the line shown in the figure for a series of wildfires that could burn in fuel conditions created by Douglas-fir beetle. The graph should not be interpreted as displaying a prediction as to when such a disturbance might occur but rather a representation of changes such an event could cause on stand characteristics that influence fire intensity and severity. After fire occurrence, the fuel loading and potential flame lengths would be reduced while fuel accumulated from trees killed by the fire. After several years of fuel accumulation, the potential would rapidly increase, which would explain the repeat burns historically

common to inland forests (Leiberg, 1897; Zack and Morgan 1994). Following these reburns potential intensities would be lower for several years as forests became reestablished. This same process controls stand density levels and species composition.

The effects of no action are presented in a range. Region One Entomologists have predicted that the Douglas-fir beetle epidemic will continue for 2 to 4 years killing additional timber in stands that exhibit characteristics preferred by the beetle. The first figure presented below represents the effects of the current infestation levels, the second figure represents the effects of the projected extent of the epidemic. The actual acreage may be more or less than the projected level, there are too many factors that could influence the extent of the infestation to predict exactly how far the beetle will go. The values for fuel accumulation risk equate to the tons per acre of beetle killed trees that will be available to fall and become surface fuel for a ground fire, these values are in addition to existing fuel loadings.

Table III-III-208. Fuel accumulation risk under Alternative A, Priest Lake Ranger District

Fuel Accumulation Risk	Current Acres Untreated	Projected Acres Untreated	Treated Acres
Less than 40 tons/acre	7,750	10631	0
Greater than 40 tons/acre	140	590	0

Table III-209. Fuel treatment under Alternative A, Priest Lake Ranger District

Fuel Treatment	Prescribed Fire	Pile and Burn	Yard Tops	Lop & Scatter Tops
Acres	0	0	0	0

As discussed previously under the Characterization and Existing Conditions section, maintaining seral species is an important step in sustaining forested environments that can adapt and sustain disturbances within the range of natural variability. Changes to structural stage and species composition are discussed in the Vegetation section of this FEIS.

Cumulative Effects Common to All Alternatives

The effects of the Douglas-fir beetle on infested forested areas will be an acceleration of successional changes that the areas are currently going through. The Douglas-fir beetle infestation on the Priest Lake District is projected to cover approximately 11,200 acres within a Ranger District over 322,500 acres in size. As a percentage, this is rather insignificant and would not in itself lead to catastrophic large stand replacing wildfires. As stated earlier, most large stand replacing fires on the Idaho Panhandle and Colville National Forests are wind driven or the result of regional climactic patterns, salvaging beetle killed trees would have minimal affect on such an event. Of significance is the fact that this alternative is a continuation of trending forested ecosystems further outside their range of historic species composition, see Chapter III, vegetation section.

Direct and Indirect Effects Common to All Action Alternatives

The Douglas-fir beetle outbreak in the analysis area presents long-term fire and fuels consequences. Significant accumulations of additional fuel and increased mortality result in an increase in snag density. With the beetle induced thinning in the overstory, regeneration of species tolerant to insects and disease will begin to occur. This provides the fine fuels necessary for a fast moving fire and the heavy down fuel loadings; contributing to higher than normal fire intensities. These conditions could persist for several decades, combined they present serious safety hazards to firefighters when suppressing fires in affected stands.

It is not possible or desirable to "fireproof" fire dependant ecosystems, but the potential of severe fire can be reduced by proactive land management. Federal land management agencies can mimic natural disturbances, but it is essential for managers to consider that current conditions may be considerably different than those conditions that occurred historically. Reintroduction of native processes such as fire without modification of structural patterns, fuel loadings, and spatial distributions can produce unpredictable and undesirable effects (USDA, USDI, 1996). Multiple treatments will be needed to regulate vegetation structure, composition, and associated biomass loadings. Long management horizons may be required to restore unhealthy ecosystems to more sustainable conditions. The most effective means to restore long--term forest health will be density and fuels management, plus regulation of species composition to improve the dominance and distribution of seral species (Harvey, et.al. 1995, USDA 1999a). The use of prescribed fire alone for stand restoration would be largely ineffective (with spring burns), or downright harmful and wasteful (dry season burns) (Barrett, S. W. 1994). In the case of the Idaho Panhandle and Colville National Forests, the lack of an adequate seral species seed source would assure long term failure of vegetative restoration efforts without artificial regeneration of seral species.

Timber harvest would significantly affect both short and long-term fuel loading. Timber harvest converts unavailable aerial fuels into available surface fuels. Thus the risk of crown fire may be reduced while the risk of surface fire can be increased by adding fuel to the ground. An increased fire hazard and risk of ignition from timber harvest may ~~would~~ result. Treatment of created fuels can reduce these risks.

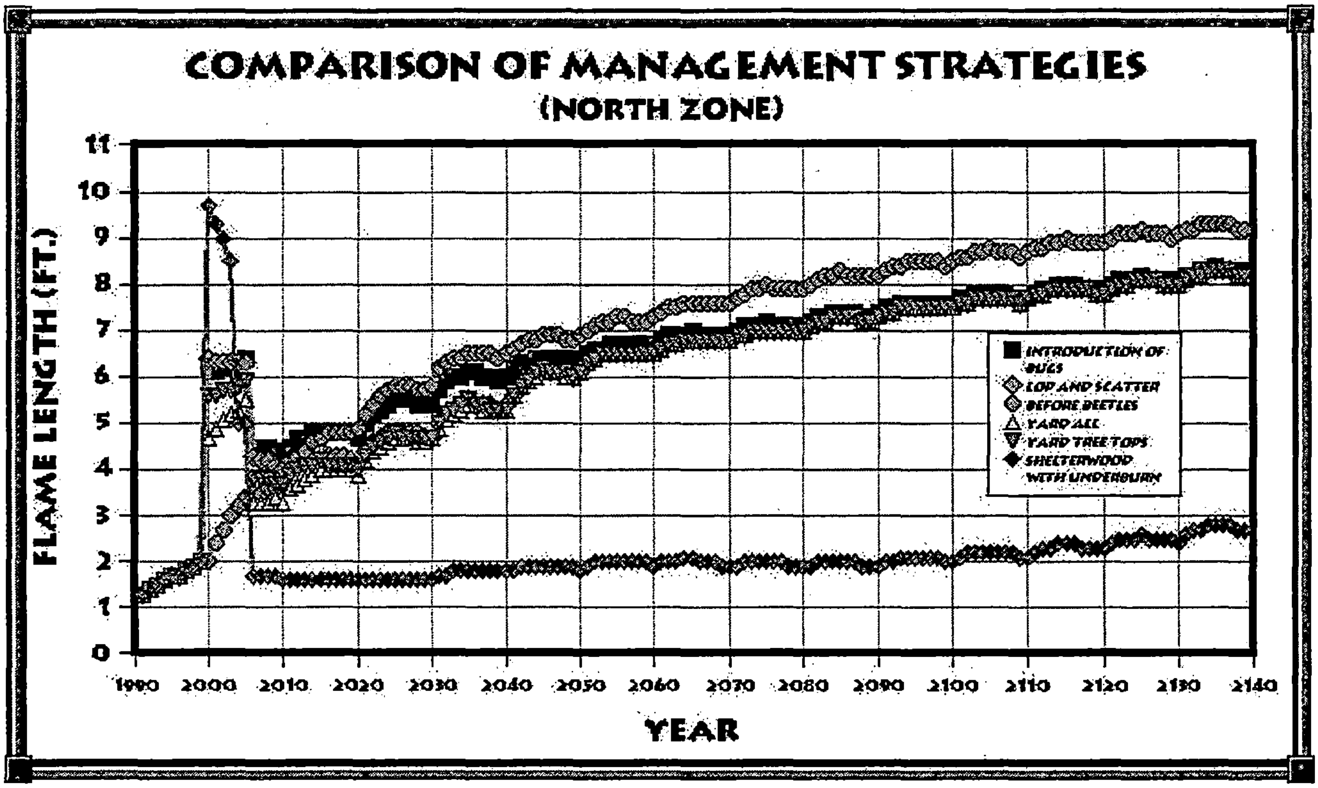
The potential for a fire outside of proposed harvest areas, the overall fuel mosaic on the landscape, and future vegetation and fuel succession must be considered when planning fuels treatments. Natural stands and particularly partial-cut stands that are not treated for fuels reduction, could experience greater fuel buildup over time than treated managed stands. Treating risk areas where harvest takes place in this timber sale entry provides an opportunity to reduce fuel loading and continuity with stands and over the entire analysis area.

Effects Common to Alternatives B, C, D, E and F

Any type of human activity increases the possibility of ignition and wildfire. Common ignition sources include; equipment operation, smoking and arson. The timber purchaser will be required to have fire equipment and to take necessary fire precautions to prevent a wildfire from occurring. In the event of extreme fire conditions, the harvest activities would be regulated or suspended until conditions improve. The timber sale administrator closely monitors the fire prevention requirements of the timber contract throughout the timber harvest operations.

While these alternatives would treat some areas where fuel accumulation would be a concern, they do not treat all stands, especially if the beetle infestation continues as predicted by entomologists. The Preferred fuels treatment for all units that contain fire resistant species is underburning. In other units, slash will be piled and burned where slopes permit. Alternatives F and D incorporate additional fuel treatment adjacent to private lands.

Figure III-13. Comparison of effects of management strategies for treatment of fuel accumulations.



The figure above displays the result of the FFE-FVS model outputs for one stand on the Priest Lake District. These results are typical for stands modeled and represent a mid range effect (Reinhardt, 1999). As depicted, fuel loadings and flame lengths of a wildfire would be expected to increase over time as a forested stand matures and surface fuels accumulate faster than the decay rate. Because of the Douglas-fir beetle induced changes in stand structure, these changes would occur at an accelerated rate. The immediate effect would be for increased wind penetration into forested stands, which in the event of a fire start, would increase flame lengths and rates of spread. In successive years, the model depicts the effects of surface fuel loading changes as portions of limbs and tops from the beetle killed trees fall to the ground. As the dead fuel accumulation from the beetle killed trees slows, increases in regeneration provide fine fuels necessary to maintain flame lengths and spread rates. Heavy fuels increase the open flame and smoldering time periods, increasing severity.

Three different management scenarios were modeled. These scenarios include salvage logging with two different slash treatment prescriptions, yarding of tops and lopping tops. The third scenario was a regeneration harvest system, shelterwood with reserves, followed with broadcast burning. As displayed by the figure above, in the short run salvage logging would increase potential flame lengths. This is because when these trees are harvested, all fuel would be on the ground instead of accumulating more slowly as under the no action alternative. Yarding tops would reduce fuel loadings and potential flame lengths somewhat but would not eliminate the increases seen with other options because of breakage and increased solar and wind penetration into the stand. It was estimated that yarding tops would only remove 50 percent of the tops of harvested trees, dead Douglas-fir would be more brittle than green trees so breakage of tops and limbs would be significant. Removal of all logging slash would not totally eliminate the potential for increased flame length should a fire occur because the extent of mortality would provide more open stand characteristics allowing increased wind and solar penetration. Regeneration

harvesting, followed with underburning appeared to be the best treatment to reduce fuel loads and reestablish seral species.

As discussed previously, under the Characterization and Existing Conditions section, maintaining seral species is an important step in sustaining forested environments that can adapt and sustain disturbances within the range of natural variability. Effects of these action alternatives on changes to structural stage and species composition are discussed in the Vegetation section of this Final EIS.

The values for fuel accumulation risk, displayed in the table below, equate to the tons per acre of beetle-killed trees that will be available to fall and become surface fuel for potential ground fires. These values are in addition to existing fuel loadings and equal untreated acreage after implementation of Action Alternatives.

Table III-210. Fuel accumulation risk for Alternatives B, C, D, E, F on the Priest Lake Ranger District.

Alternative	Fuel Accumulation Risk	Untreated Acres	Treated Acres
Alternative B	Less than 40 tons/acre	5,600	5,031
Alternative B	Greater than 40 tons/acre	240	350
Alternative C	Less than 40 tons/acre	5,600	5,031
Alternative C	Greater than 40 tons/acre	240	350
Alternative D	Less than 40 tons/acre	3,582	7,049
Alternative D	Greater than 40 tons/acre	156	434
Alternative E	Less than 40 tons/acre	5,885	4,746
Alternative E	Greater than 40 tons/acre	259	331
Alternative F	Less than 40 tons/acre	6,807	3,824
Alternative F	Greater than 40 tons/acre	404	186

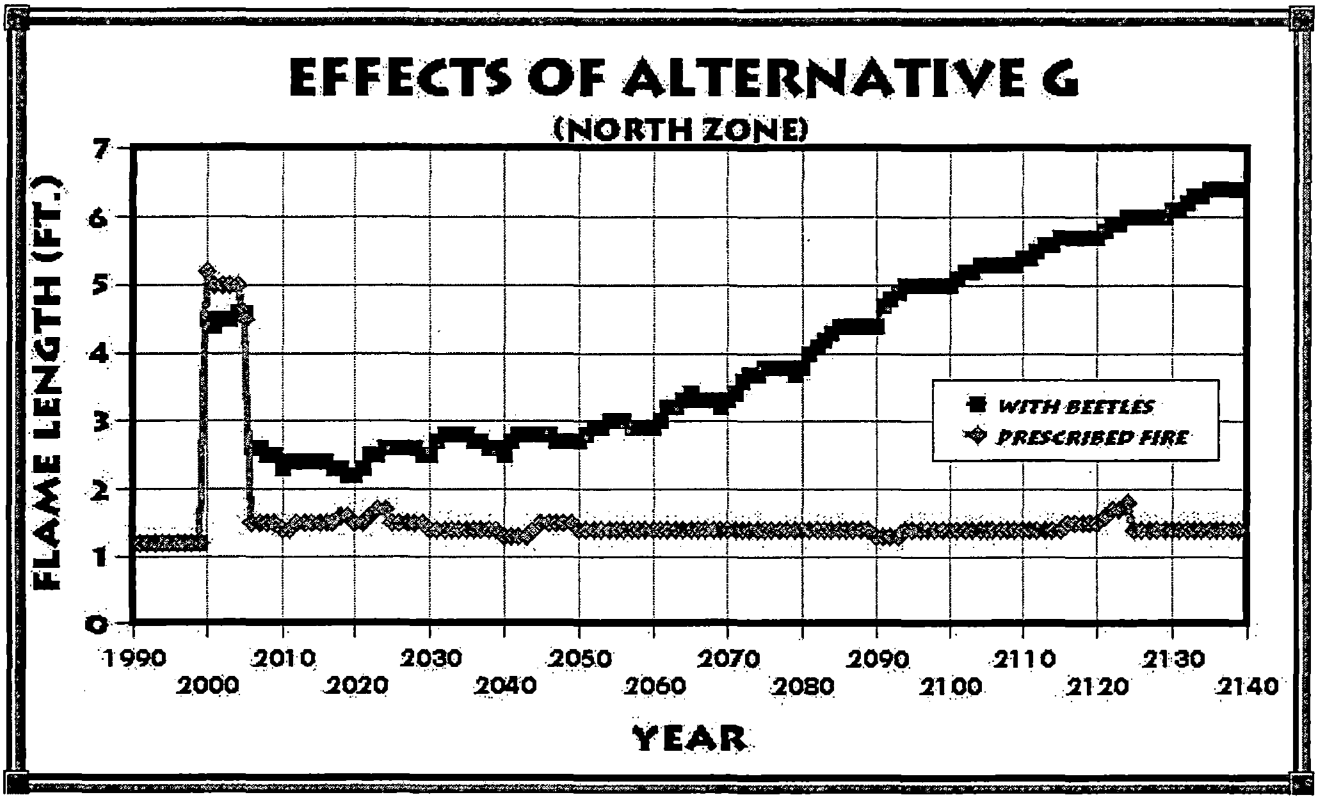
Table III-211. Fuel treatment for Alternatives B, C, D, E, F on the Priest Lake Ranger District.

Alternative	Fuel Treatment	Prescribed Fire	Pile and Burn	Yard Tops	Lop Tops
Alternative B	Acres	3,090	692	276	1,348
Alternative C	Acres	3,030	692	276	1,408
Alternative D	Acres	3,705	642	331	2,835
Alternative E	Acres	1,929	740	237	2,191
Alternative F	Acres	1,946	406	271	1,412

Alternative G

Alternative G was developed to treat fuel accumulations without the use of timber harvest. Stands were selected for prescribed fire treatment based on the ability of fire managers to meet vegetation management objectives with prescribed fire. This alternative proposes 366 acres of prescribed fire. This alternative would treat a very small portion of areas where fuel accumulation and presence of snags would be a concern, it did not treat a majority of the stands.

Figure III-14. Predicted effects of fuel conditions created by the beetle infestation, and effects of prescribed fire under Alternative G.



The figure above displays the results of the FFE-FVS model outputs for one stand on the Priest Lake District. The stand was an old growth ponderosa pine stand with heavy Douglas-fir ingrowth. With Douglas-fir beetle mortality in larger Douglas-fir, slashing of trees less than 14 inches in diameter and prescribed fire, fuel loadings and flame lengths of a wildfire would be expected to decrease to patterns historically associated with similar forest types. Sites modeled were dry Douglas-fir and grand fir sites, prescribed fire was applied at approximately a 20 year interval.

Table III-212. Fuel accumulation risk for Alternative G on the Priest Lake Ranger District.

Alternative	Fuel Accumulation Risk	Untreated Acres	Treated Acres
Alternative G	Less than 40 tons/acre	10,320	311
Alternative G	Greater than 40 tons/acre	535	55

Table III-213. Fuel treatment for Alternative G on the Priest Lake Ranger District.

Alternative	Fuel Treatment	Prescribed Fire	Pile and Burn	Yard Tops	Lop Tops
Alternative G	366 Acres	366	0	0	0

Cumulative Effects at the Priest Lake Ranger District Scale

Cumulative Effects Common to All Action Alternatives

As stated earlier, most large stand replacing fires on the Idaho Panhandle and Colville National Forests are wind driven or the result of regional climactic patterns, salvaging beetle killed trees would have minimal affect on such an event (USDA. 1998a). The scattered nature of regeneration units with underburning also would have minimal affect on such an event. This alternative does contribute to restoration of historic species composition, albeit in a small and scattered nature, see Chapter III, vegetation section.

Cumulative Effects on Private Lands

The amount of private land ownership within each analysis area was addressed in the previous vegetation section. The effects of Douglas-fir beetle mortality on other ownerships within the project area would be difficult to ascertain due to a lack of detailed information on current conditions and on how private land owners will treat beetle killed trees. In very general terms, non-industrial forest owners and industrial forest owners are likely to aggressively harvest dead and dying trees because of their commercial value. Owners of small home sites and recreational property are less likely to harvest their timber. Private landowners that do harvest trees are less likely to invest money in reforestation, so most regeneration will be from natural seeding.

Most information on vegetation and fuel conditions and planned treatments have been obtained from aerial photos, satellite imagery and personal knowledge. Some information on past and planned harvest and road building has been gathered from industrial owners and on state lands, but generally no specific information is available for non-industrial private landowners. The information that is known has been included in Appendix E.

In general, most private lands are on lower elevations and receive less moisture and are comprised of a higher percentage of dry sites than National Forest lands. There are industrial timberlands in some of the higher elevations. Some past harvests have been regeneration harvests that have created some openings in the forest canopy and have resulted in regeneration of seral species. But many existing openings, particularly in the lowlands, are a result of land clearing for homes and pastures. Other private lands are natural openings or meadow lands acquired through homesteading or other means.

More often, timber harvests on private lands tend to be partial cuts that remove trees of the highest economic value (usually the largest) and typically removes large fire resistant seral species. Natural regeneration is relied on to fill most created openings. This tends to favor shade tolerant Douglas-fir and grand fir over early seral species such as pine and larch. As previously discussed, the historic fire adapted vegetation structure was lost early in the century. With increased rural/urban development, it is probably safe to say that inherent disturbance regimes and historic vegetation patterns will never be reestablished on a landscape scale. This pattern of vegetation change has led to increased fire intensities and severities and is expected to continue. Private lands are expected to be managed similar to the past.

Since private lands often include residences and other developments, fire will continue to be aggressively suppressed, although the potential for increased ignitions continues to rise as human use increases. Land management agencies in Northern Idaho and Eastern Washington are not advocating a return to historic disturbance regimes at the landscape level. Natural disturbance regimes included severe and rapidly moving forest fires that sometimes exceeded 100,000 acres. Over 500,000 people now live in an area that historically was inhabited by 5,000 - 10,000 Native American people. While the full range of historic fire regimes was a functional part of the historical natural ecosystem, we are now operating in an environment of a changed human context. Returning to the full range of historic disturbance patterns would generate significant threats to human life and property. Even smaller threats (i.e. Fire Storm 91) have not been acceptable to the public.

Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions are listed in Appendix E. These future actions are not individually or cumulatively of a scale similar to historic disturbance patterns. Disturbances similar to historic proportions would be necessary to facilitate the vegetation restoration that is needed to change trends in potential fire intensities and severities. Foreseeable future actions would result in vegetation restoration at the stand scale.

Effects of Opportunities

Timber Stand Improvement (Precommercial Thinning and Pruning) - Stands identified as future thinning needs are identified in the project file. Thinning redistributes growth and adjusts species composition for the future. Thinning would favor healthy trees of desired species adapted to the various habitat types. The seral species of ponderosa pine, western larch, and white pine would be favored when present on the appropriate growing sites. The effects of this action in the long run will be to move stands towards historic species composition and make them more resilient to disturbances such as wildfire. In the short run, increases in dead fine fuels would increase wildfire intensity should one occur.

Watershed and Wildlife Restoration - Restoration opportunities that may be accomplished are predominately road obliteration. The ignition density analysis for the Idaho Panhandle and the Newport District portion of the analysis area shows that most of the highest ignition densities are in developed areas. Decreasing the road density may result in a small decrease in human caused wildland fires, although the change may not be noticeable because there would not be a significant change in road densities or use patterns on the travel zones that have the highest ignition density.

Noxious Weed Treatment and Monitoring - Noxious weed treatment and monitoring would have no effect on wildland fire intensities in forest fuel types. If spotted knapweed were to invade and dominate surface vegetation in dry open forest types and meadow types, a reduction of fire intensity could be expected. Spotted knapweed outcompetes native grasses and does not burn well. In areas where knapweed infestations are reduced in these types, fire intensities could be expected to increase in the event of wildland fire.

Consistency With the Forest Plan

The goal of the Forest Plan is to provide efficient fire protection and fire use to help accomplish land management objectives. Alternative A excludes fuels treatment, Alternative G treats a minor portion of the infested acreage there would be little difference between it and the No Action Alternative. The continued succession of fuels and vegetation, mortality from insect disease, and the exclusion of fire will create areas where the trend in fire behavior characteristics will in time exceed the goals, objectives and standards established in the Forest Plan.

Action alternatives propose prescribed burning and makes progress towards reducing the risk of wildfire. Even with this treatment, untreated areas and areas treated with salvage harvest will continue to trend toward characteristics that exceed the goals, objectives and standards established in the Forest Plan.

AIR QUALITY

CHANGES BETWEEN THE DRAFT AND FINAL EIS

In response to comments and in recognition of errors in the Draft EIS, the Final EIS has changes in the Air Quality section. Minor changes have taken place in the analysis numbers in most alternatives. Many wording and other editing changes have taken place to further clarify the descriptions of information provided. Results of FOFEM emissions modeling are displayed in tabular format and included in the Final EIS.

REGULATORY FRAMEWORK

Current direction to protect and improve air quality on National Forests is provided by 1) the Forest and Rangeland Renewable Resources Act of 1974 (16 U.S.C. 1601), as amended by the National Forest Management Act (16 U.S.C. 1602); 2) the Federal Land Management Policy Act of 1976 (43 U.S.C. 1701); and 3) the Clean Air Act amendments of 1977 and 1990 (42 U.S.C. 7401-7626). The Clean Air Act (Section 110) requires states to develop State Implementation Plans (SIPS) which identifies how the State will attain and maintain national air quality standards.

The Clean Air Act amendments of 1977 set up a process which included designation of Class I, II, and III areas for air quality management.

- *Class I - These areas include all international and national parks, greater than 6,000 acres, and national wildernesses greater than 5,000 acres which existed on August 7, 1977. This class provides the most protection to pristine lands by severely limiting the amount of additional man-made air pollution which can be added to these areas. The nearest federally designated Class I area is the Cabinet Wilderness, located approximately 65 air miles east on the Idaho-Montana border. The Pasayten Wilderness, another Class I area, is located approximately 90 miles to the west. The risk of smoke intrusion into Class I airsheds from any prescribed burning operations in the project area would be very minimal due to distance and prevailing winds. Smoke created from the Lower Priest Lake and Pend Orielle analysis area is normally carried to the northeast by the prevailing southwest flows aloft and will not normally affect Class I airsheds.*

- *Class II - These areas include all other areas of the country. These areas may be upgraded to Class I. A greater amount of additional man-made air pollution may be added to these areas. All Forest Service lands which are not designated as Class I are Class II lands. All of the land within the Analysis Area is designated as Class II.*

- *Class III - These areas have the least amount of regulatory protection from additional air pollution. To date, no Class III areas have been designated anywhere in the country.*

The Clean Air Act of 1977 (as revised 1991) requires the Environmental Protection Agency (EPA) to identify pollutants that have adverse effects on public health and welfare and to establish air quality standards for each pollutant. Each state is also required to develop an implementation plan to maintain air quality. The EPA has issued National Ambient Air Quality Standards (NAAQS) for sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter less than or equal to 10 microns (PM 10). Idaho and Washington also have standards for these pollutants. Particulate standards were originally defined in terms of Total Suspended Particulate (TSP). Recently, the Environmental Protection Agency (EPA) has changed the particulate standard to apply to small particulate less than 10 microns in diameter (PM10). This change was made because PM10 is too small to be effectively filtered by the human respiratory system and much of it penetrates deep into the lungs. When inhaled, these small particulates can cause respiratory problems, especially in smoke sensitive portions of the population such as the young, elderly or those predisposed to

respiratory ailments. The Act defines NAAQS as levels of pollutant above which detrimental effects on human health and welfare could occur. An area that is found to be in violation of NAAQS is called a non-attainment area. Pollution sources in these areas are subject to tighter restrictions. Spokane, Libby, Sandpoint, Fernan and Pinehurst are federally designated non-attainment areas, because of an excess of PM 10.

Airshed Groups are assembled in North Idaho and Montana to work cooperatively to "minimize or prevent" accumulation of smoke in Idaho and Montana to such degree as necessary to meet State and Federal ambient air quality standards when prescribed burning is necessary for the conduction of accepted forest practices, ie. hazard reduction, regeneration site preparation and wildlife improvement (MOA, 1990). The U.S. Forest Service, Coeur d'Alene River Ranger District, is a member of this group and adheres to the group's restriction procedures. As monitoring units, the airshed groups may reduce burning, stop burning in specific areas, or cease burning entirely when meteorological or existing air quality conditions so warrant. Forest management burning is thereby regulated during the months of September through November (North Idaho Cooperative Smoke Management Plan).

AFFECTED ENVIRONMENT

The area affected by the Douglas Fir Beetle on the Priest Lake Ranger District lies on the west side of Priest River, generally south of Upper Priest Lake. The air quality in this area is generally considered very good although an occasional negative impact has occurred due to smoke from wildfires, debris/waste burning, smoke and dust from agricultural activities, and vehicle exhaust and dust. The prevailing winds are from the west/southwest and normally push smoke from prescribed burning to the northeast and out of the planning area during the spring and fall burning seasons. Existing air quality has been determined by visual observations and annual reports from the North Idaho Smoke Management Committee which includes air quality monitoring data compiled by the Idaho Department of Environmental Quality (DEQ) and the State of Washington Department of Natural Resources.

Historically fire, and therefore smoke, have always been part of the Northern Rockies ecosystem. Fire history would indicate impacts by smoke on an infrequent basis. Fires occurring naturally in the assessment area and the general weather regimes of North Idaho indicate emissions persisting from a few hours to several days. These impacts would have occurred in the summer and early fall months.

The effect of Euro-American settlement and subsequent fire protection has reduced the amount of area burned, under some firefighting conditions, and reduced the duration of smoke emissions from wildland fires. In the case of prescribed fire, the amount of smoke generated has been mitigated from earlier levels of post settlement burning by forest managers scheduling burns for periods during good to excellent dispersion.

The Clean Air Act (1967 and amendments to the Act 1972, 1977, 1990), provide direction to protect and enhance the quality of the Nation's air resources and to protect public health and welfare. The Act provided the States primary responsibility for air quality management.

ENVIRONMENTAL CONSEQUENCES

Methodology

The primary method used to determine the estimated effects on air quality for the action alternatives is described below:

Emission production modeling was completed for each alternative using the First Order Fire Effects Model (FOFEM) (see project file). This model is a software program designed for resource managers to estimate woody fuel consumption and smoke production for forest stands (USDA 1997d).. FOFEM models emission

production, not visibility or dispersion. Categories of emissions estimated are PM 2.5 (particulate matter less than 2.5 microns in diameter), and PM10 (particulate matter less than 10 microns in diameter).

Disposal of slash from harvesting through the use of prescribed fire can temporarily affect air quality. Slash and heavy fuel loading also increases potential wildland fire intensities and severity. Prescribed fire is often used as a tool to reduce fuel loadings thereby reducing potential intensities and severity.

The Idaho Panhandle National Forest is a party to the North Idaho Smoke Management Memorandum of Agreement, which established procedures regulating the amount of smoke produced by prescribed fire. A principal objective of the North Idaho Smoke Management Agreement is to "minimize or prevent the accumulation of smoke in Idaho to such a degree as is necessary to protect State and Federal Ambient Air Quality Standards when prescribed burning is necessary for the conduct of accepted forest practices..." The North Idaho group currently uses the services and procedures of the Montana State Airshed Group. The procedures used by the Montana Group are considered to be the Best Available Control Technology (BACT) by the Montana Air Quality Bureau for major open burning in Montana. A Missoula-based monitoring unit is responsible for coordinating prescribed burning in North Idaho during the months of September, October, and November. This unit monitors meteorological data, air quality data, and planned prescribed burning and makes a decision daily on whether or not any restrictions on burning are necessary the following day.

In practice, a list of all prescribed burning planned for the fall burning season on the Priest Lake Ranger District is forwarded to the monitoring unit through the Idaho Panhandle National Forest Dispatch Center before September 1. By 8:30 a.m. daily, the Priest Lake Ranger District informs the dispatch center of all burning planned for the next day and the fire desk forwards this information to the monitoring unit. By 3:00 p.m. the same day the monitoring unit informs the Forest if any restrictions are to be in effect the following day, and the fire desk informs the District. All of these precautions would limit smoke accumulations in the valley to legal, acceptable limits.

This practice has also been proposed to monitor spring burning in the year 2000. However, it is anticipated that prescribed burning associated with this project will not occur before the fall of 2000.

The Priest Lake Ranger District follows the Washington State Smoke Management Guidelines for all prescribed burning projects located within the State of Washington. Requests to burn are made the previous day, through the appropriate Forest Dispatch Center, to the Washington State Department of Natural Resources (WDNR) in Olympia, Washington, who administers the smoke management program. Approval or denial to burn based on weather and atmospheric conditions is sent to the Forest dispatch office the following morning. The WDNR Smoke Management Program considers proximity to Class I airsheds, non-attainment areas and weather factors that may cause an intrusion into these areas. Based on the area/unit descriptions sent to the WDNR from the districts fire and fuels organization, a determination would be made as to how much or which units can safely be burned and stay below NAAQS thresholds of PM10 production.

Historically, prescribed burning on the Priest Lake Ranger District occurs in the spring and fall seasons over a time span of 45 to 60 days during each season. All burning would comply with federal, state and local regulations. Management practices include, but are not limited to, burning under spring like conditions (high fuel, soil and duff moistures) to reduce emissions and provide for retention of large woody debris, evaluation of atmospheric stability to validate predictions of windflow and smoke dispersal, and public contact and education. Within the State of Washington, any prescribed fire activities consuming more than one hundred tons of fuel within a 24-hour period would require approval from the State. It should also be noted that control of the burning prescription during a spring or fall burn would generate less smoke than a much hotter stand-replacing summertime wildfire, as much of the fuel would have been removed by harvest operations.

Direct, Indirect and Cumulative Effects

Alternative A (No Action)

Direct and Indirect Effects

Alternative A is the No Action alternative, under which there would no change from current management direction or from the level of management intensity in the area. Timber harvest, reforestation, watershed rehabilitation, or road obliteration activities, and fuels treatments in connection with the Douglas-fir beetle infestation, would not be initiated at this time. This alternative would have no immediate adverse effect on air quality. Current management activities in this area contribute little additional pollutants to the local airsheds. The primary source of pollution would be from vehicular exhaust and dust from motor traffic in the area.

Cumulative Effects

The potential for air quality degradation and reduced visibility may increase with this alternative. Existing and increased mortality in the analysis area contributes to increased intensities and severities if a wildland fire were to occur. Consumption of increased fuel loads and understory biomass would increase the amount of smoke emissions in the event of a wildland fire. These emissions may remain in the local and surrounding airsheds for a period of a few days to several weeks depending on the fire's size and intensity.

Effects Common to All Action Alternatives

Direct and Indirect Effects

All of the action alternatives include underburning for fuel reduction, seed bed preparation, and nutrient recycling purposes. For action alternatives B-F, additional burning would also be implemented to dispose of landing and excavator piles. Because of the time of year that underburns are conducted, either spring or fall, and because of the clearance required in order to burn (as described previously), the resulting smoke from this burning would minimally affect air quality. Fugitive dust generated from road construction, reconstruction, and increased vehicle traffic may also temporarily affect air quality. Smoke from the project area may temporarily affect Libby and Sandpoint but not normally Spokane, Fernan or Pinehurst because of the prevailing winds. Timber Sale contracts would require dust abatement during dry periods where dust from road travel becomes a problem.

Results of the FOFEM emissions modeling determined annual PM 2.5 and PM 10 standards would not be exceeded for each alternative. These results are based on completing approximately 20% of burning annually by alternative.

Table III-214. Summary of approximate fuel treatment acres, Priest Lake Ranger District.

Treatment	ALT.A	ALT. B	ALT. C	ALT. D	ALT. E	ALT. F	ALT.G
Underburn	**0**	**3,090**	**3,030**	**3,705**	**1,929**	**1,946**	**366**
Burn Landings	**0**	**25**	**25**	**30**	**20**	**25**	**0**
Lop and Scatter	0	1,348	1,408	2,835	2,191	1,412	0
Top Attached Yard	0	276	276	331	237	271	0
Machine Pile & Burn	0	667	667	612	720	381	0
Total Harvest Acres	0	5,381	5,381	7,483	5,077	4,010	0
Total Treatment Acres*	0	5,406	5,406	7,513	5,097	4,035	366
Emissions from burning							
Total tons of PM10	0	406	403	419	363	245	19
Total tons PM2.5	0	343	340	354	311	207	16

* *The number of total treatment acres exceeds harvested acres by the burn landings acreage.*

Fuels treatments for action alternatives, are scheduled to be completed within five years after harvest operations.

Fuel Treatment Methods

Numerous methods of prescription fire would be implemented to treat activity created and natural fuels:

Underburning: This is a method designed to meet various resource objectives where a tree canopy is present and is to be preserved. The treatment reduces woody debris, provides site preparation for natural or artificially planted regeneration and eliminates unwanted vegetation. Underburning can also improve wildlife habitat.

Underburning may have a significant short term impact on air quality given the slow ignition and high fuel moistures. As a result of the inefficient combustion these treatments are usually conducted during spring conditions when atmospheric conditions promote ventilation.

Pile burning (machine or hand): This is a relatively inexpensive treatment used to dispose of woody debris. Employing top attached yarding methods, woody debris is removed from sites to roadside landings or hand piled on site where the woody debris can be burned safely and inexpensively. Pile burning is conducted in late fall and compared to underburning reduces smoke emissions from 25 to 50 percent and increases combustion efficiency as much as 95 percent (D. Ward, 1992).

In addition to fuel treatments using prescription fire other non-fire fuel treatments would be utilized:

Lop and Scatter: Branches are cut from felled trees to a predetermined height then scattered to reduce fuel concentrations. The objective is to rearrange the fuel so as to eliminate concentrations and break up vertical and horizontal continuity. Generally this treatment hastens natural decomposition and improves esthetic qualities of the treated area.

Top attached yard: Trees are yarded out of the woods with the top attached to the top log. The top and limbs are severed from the merchantable bole at the log landing and placed in piles for burning. Burning can be done later or commensurate with logging.

Cumulative Effects

The monitoring of air pollutants during prescribed burning seasons is used to eliminate burning during times when such activities would result in violations of the State standards, including unacceptable impacts to non-

attainment areas. The Forest Service voluntarily ceases burning operations to avoid violations of State standards. The monitoring of air pollutants during prescribed burning periods have not recorded any violations of the State standards to date. Burning of activity-created fuels would occur primarily in early spring when demand for airspace has been historically low. Smoke and particulate matter flows to the northeast and dissipates rapidly during good to excellent dispersion days.

Foreseeable Future Actions

Appendix E contains a list of reasonably foreseeable and ongoing activities in the project area. Smoke produced from fuel treatments would compete with other activities within the airsheds. Activities such as agricultural field burning, other forest residue burning, residential wood stove use, motor vehicle-produced exhaust and dust, and even dust from the Palouse and Columbia basin all produce pollutants that contribute to degradation of air quality.

Effects of Opportunities

The opportunities described in Chapter II would not effect air quality.

Consistency With the Forest Plan and Other Applicable Regulatory Direction

The Forest-wide objectives for air quality include maintaining excellent air quality on the Forest and to protect local and regional air quality by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) Program and the State Implementation Plan (SIP). Requirements of PSD, SIP and the North Idaho/Montana Smoke Management Plan would be met.

Smoke Management for air quality is monitored by the North Idaho/Montana Airshed Group and the Washington Department of Natural Resources. The Idaho Panhandle National Forests coordinates and schedules burning activities to maintain air quality. Burning plans describing how and under what conditions the burning would take place are prepared by qualified personnel. The project meets the Clean Air Act through coordination with the State prior to burning, and the use of burning techniques that minimize smoke emissions.

Prescribed burning is consistent with State laws requiring treatment of activity created fuels to reduce the effects of catastrophic forest fires.

WILDLIFE

REGULATORY FRAMEWORK

The regulatory framework providing direction for the protection and management of wildlife habitat comes from the following principle sources:

- *The Endangered Species Act of 1973 as amended (ESA),*
- *The National Forest Management Act of 1976 (NFMA), and*
- *The Forest Plan for the Idaho Panhandle National Forests*

Section 7 of the ESA directs Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any Threatened or Endangered species or result in the destruction or adverse modification of their critical habitat.

NFMA provides for balanced consideration of all resources. It requires the Forest Service to plan for diversity of plant and animal communities. Under its regulations the Forest Service is to maintain viable populations of existing and desired species, and to maintain and improve habitat of management indicator species.

The Forest Plan, in compliance with NFMA, establishes Forest wide management direction, goals, objectives, standards and guidelines for the management and protection of wildlife habitat and species, including: old-growth habitat, management indicator species, Sensitive species, and Threatened and Endangered species.

Direction concerning implementation of the ESA and NFMA can be found in Forest Service Manuals (FSM) and various letters/memos from the Washington Office, the Regional Office and the Supervisor's Office.

AFFECTED ENVIRONMENT

Introduction

Wildlife populations and habitats do not stay constant over time. Habitat changes result in population increases or decreases, depending on the species. Prior to European settlement, human impacts to wildlife habitat were minimal. Fires and insect/disease outbreaks were the primary processes and disturbances affecting habitats in the assessment area. Low intensity, frequent fires maintained open understories in ponderosa pine and drier Douglas-fir habitats. Western white pine, ponderosa pine and western larch forests, especially in old forest condition, were more abundant than today. Much of the current old growth is comprised of the shade tolerant species such as western hemlock, Douglas-fir and grand fir (please refer to the Vegetation discussions for additional information).

Old and Mature Forests

Many wildlife species occurring within the assessment area prefer or only occur in mature and old-growth forests. Mature and old forests are more likely than younger forests to provide habitat for these species because they are more complex and structurally diverse. Existing immature stands could grow into old-growth habitat over time if not disturbed or if they are managed to maintain large, old, diseased and dead structural components of the forest within levels needed to provide suitable habitat.

Old-growth and mature stands of trees have been reduced in amount and patch size across the Idaho Panhandle National Forests. Currently, 15% of the Priest River subbasin is old growth compared to a

historical average of 24%. The Columbia Basin Assessment lists species considered at risk due to their association with old and mature forests (e.g. open-grown ponderosa pine stands). Some of these species include the flammulated owl, boreal owl, Vaux's swift, and Lewis' woodpecker.

Dry Forest Habitats

These habitats have evolved with frequent, low intensity ground fires (see Veg. section). To protect human developments and forest resources, fires have been excluded for most of this century. This has allowed smaller, shade-tolerant trees to become established under the canopy of the dry site species, resulting in a change in forest structure from what was traditionally open-grown or park-like to a dense, multi-canopied forest.

Some wildlife species that prefer open, dry forests with large trees include flammulated owls, pygmy nuthatches, white-headed woodpeckers, western bluebirds and Lewis' woodpeckers. Forests which have developed a dense understory of grand fir or other shade-tolerant conifers are no longer suitable for these birds. Historically, within the Priest River subbasin, 3.7% of the acres dominated by ponderosa pine cover types. forest cover types. Today, 1.6% acrea are dominated by ponderosa pine.

Snags and Dead Down Woody Habitat

Over 40 wildlife species depend on snags (dead trees) for nesting, foraging, cover, etc. Not all species of trees are used by snag dependent wildlife; some tree species appear to be more important than others. Large diameter snags provide habitat for the greatest variety of cavity users and remain standing longer than smaller snags. Ponderosa pine and western larch are two such species that persist on the landscape longer than most other species. Many of these birds that utilize snag habitat promote forest health by controlling forest insect pests.

The amount of snags and down woody material present has been identified as a measure of forestland integrity (Quigley et. al. 1996). Many wildlife species depend on dead trees for nesting, roosting, denning, foraging, resting, or shelter. These include primary cavity nesters (woodpeckers and nuthatches), which have the ability to excavate cavities; and secondary cavity users which use these excavated cavities for nesting, denning or shelter. Providing for an appropriate size, number, species and distribution of snags, that have been shown to support viable populations, is a prudent approach to managing for viable/sustainable populations of woodpeckers and other species which use snags and logs. Recent studies indicate that viable woodpecker populations occur in areas with about four to six snags per acre (Bull et al. 1997). Forest Plan directs to manage snags levels at least 60% potential capacity for lands designated for timber production. This equates to providing 135 snags per 100 acres, or 1.35 snags per acre.

After snags fall and become logs on the forest floor, they are still important to many wildlife species. They are travel corridors and cover for rodents and other mammals, reptiles and amphibians. Hollow logs are used as den sites by many species. Lynx, American marten, turkey and snowshoe hare are a few of the species which favor habitats which have abundant down logs.

In addition to snags, living trees with decay, hollow and broomed trees are important to many wildlife species and are an integral part of the natural processes and functions of forested ecosystems.

Timber harvesting and firewood gathering are common activities in the forest. Snags and down logs are preferred over live trees by many people who cut firewood. Consequently, many corridors along open roads have few snags. Forest management typically selectively harvests the diseased and dying trees. Snags are also felled during forest management activities because they may pose a safety threat to woods workers. Salvage logging after fires also removes snags from the landscape by harvesting recently killed trees. These trees have not had sufficient time to develop the decayed condition preferred by many snag dependent

species. Once large snags are removed, it may be 100 years before a regenerated stand can grow new trees and produce snags large enough to meet the needs of most snag dependent wildlife species.

Wildlife in the project areas evolved with periodic outbreaks of a variety of insects and diseases. The outbreak of the Douglas-fir beetle and tree mortality provides opportunities to retain habitat components that support a host of wildlife species. It is intuitive that species associated with old growth and snags are probably less abundant than historically. With that in mind, the beetle outbreak can be viewed as an important change that could benefit some species while adversely affecting others.

Security

Prior to European settlement local inhabitants lived and traveled mainly in the major river bottomlands. Human developments and disturbance beyond these bottomlands were minimal. Historically, most of the national forest lands were considered safe sanctuaries or retreats for wildlife that moved freely across the landscape.

Recreation, mining, timber management and other human developments have all led to an increase in the number of roads which provide access and increase wildlife/human interactions, resulting in higher mortality risks to some species.

Fragmentation

Regarding this project, the predicted beetle impacts are causing the vast majority of landscape fragmentation. Most of selectively-logged stands would be maintained at or above 50% canopy closure, maintaining travel connectivity and reducing potential fragmentation. The majority of stands proposed for regeneration harvest would not be expected to maintain the canopy closure at level needed for unrestrained movement for some species. In general, the regeneration harvest would not measurably fragment stands beyond what would occur due to the beetle activity.

On the Priest Lake Ranger District approximately 3,753 acres that are at high risk to beetle infestation would remain unharvested. These patches vary in size and are well distributed throughout the project area. Across the project area as a whole, there would be an estimated 57 patches between 100 and 150 acres in size left unharvested, 22 patches between 150 and 200 acres in size left unharvested, and 10 patches greater than 200 acres that would be left unharvested. Beetles will continue to create new patches over the next two to three years.

Design features that would apply to all alternatives would maintain connectivity and reduce fragmentation within the project area. Buffers under the Inland Native Fish Strategy would be implemented in riparian areas, ranging from 150 to 300 feet wide on either side of the stream, to maintain travel corridors for wildlife. Buffers implemented between old-growth stands and regeneration units would maintain the integrity of the old-growth stands. Harvest activity is proposed in some old-growth stands to ensure their persistence over a longer period of time. Road closure and/or obliteration is also proposed, which would have minor improvements to fragmentation.

Populations

Species associated with mature/old forest structure; large snags; or sensitive to human disturbance, (such as many Threatened, Endangered, Proposed or Sensitive species) were likely more abundant historically across the Idaho Panhandle National Forests. The gray wolf, peregrine falcon, woodland caribou, bald eagle and grizzly bear are the federally listed wildlife species which occur on the North Zone of the IPNF. The lynx is currently proposed for federal listing as a Threatened or Endangered species. All of these species have reduced populations and distribution, occurring only in portions of their former ranges.

Human developments, habitat loss, fragmentation and disturbance have affected the abundance and distribution of wildlife species. As roads were built for mining and logging, previously secure habitats were opened to motorized traffic and other disturbances, leading to displacement of wildlife (from otherwise secure habitat) and increased mortality risk. Forest management has altered the amount and distribution of structural stages resulting in changes in the amount and distribution of suitable habitat and the populations of species which require or occur in these habitats.

Some populations are artificially controlled by humans. Idaho Fish and Game has transplanted elk, woodland caribou and mountain goats to augment low populations and increase distribution. Big-game species such as deer, elk and moose are more abundant now than historically, due in large part to continued supply of early succession foraging habitats through timber harvesting and fire, and Idaho Fish and Game population management strategies.

Species Relevancy

Some elements of wildlife habitat require a detailed analysis/discussion to determine potential effects on a particular species. Other elements may either not be impacted, impacted at a level which does not influence use/occurrence or the decision to be made, and/or can be adequately addressed through design of the project. These elements do not necessarily require in depth analysis.

The level of analysis is dependent on a number of variables including, but not limited to, the existing condition, the cause and effect relationship, the magnitude or intensity of effects, the contrast in effects between alternatives, the risks to resources, and the information necessary for an informed decision. The analysis is commensurate with the importance of the impact (CEQ 1502.15), the risk associated with the project, the species involved, and the level of knowledge already in hand (USDA Forest Service, 1992).

Threatened, Endangered, Proposed and Sensitive (TES) species and other management indicator species (MIS) that are known to occur on the Priest Lake Ranger District were reviewed for their relevancy to the project by reviewing sighting records, survey records, planning documents and other sources. Relevancy was determined if there is evidence of species or habitat present within the affected area, and whether any such species or habitat could potentially be affected by the proposed actions.

No further discussion or analysis is necessary for those species or suitable habitat that are not found within the assessment area (rationale is provided in the project file for those species dismissed from further discussion).

Some wildlife species or their habitat are found to be present in the assessment area, but not measurably affected because they would not be impacted by the proposed actions, the impacts would be at a level which would not influence their use or occurrence, or their needs can be adequately addressed through the design of the project. Therefore, a detailed discussion and analysis is not warranted or required for those species determined not measurably affected (NEPA directs the agency to focus on a full and fair discussion on significant issues, and identify and eliminate from detailed study the issues which are not significant.) Supporting rationale is provided in the following section for these species.

Species considered present and possibly affected in a measurable way by the proposed actions are carried forward into a detailed discussion and analysis.

Table III-215. Species occurring within the affected project and analysis area, Priest Lake Ranger District.

Species	Species/Habitat Present?	Species/Habitat Measurably Affected?	Species Further Analyzed?
Endangered			
Gray Wolf	Yes	No	No
Peregrine Falcon	No	No	No
Woodland Caribou	Yes	No	No
Threatened			
Bald Eagle	Yes	No	No
Grizzly Bear	Yes	Yes	Yes
Proposed			
Lynx	Yes	Yes	Yes
Sensitive			
Black-backed woodpecker	Yes	No	No
Boreal toad	Yes	No	No
Coeur d'Alene salamander	No	No	No
Common loon	No	No	No
Fisher	Yes	Yes	Yes
Flammulated owl	Yes	Yes	Yes
Harlequin duck	Yes	No	No
Northern bog lemming	Yes	No	No
Northern goshawk	Yes	Yes	Yes
Northern leopard frog	Yes	No	No
Townsend's big-eared bat	No	No	No
White-headed Woodpecker	Yes	Yes	Yes
Wolverine	Yes	No	No
Management Indicator			
American Marten	Yes	Yes	Yes
Moose	Yes	No	No
Pileated Woodpecker	Yes	No	No
White-tailed Deer	Yes	No	No
Other			
Boreal Owl	Yes	No	No
Forest land birds	Yes	No	No
Snag habitat	Yes	No	No

Reference and Existing Condition

This section includes a brief discussion of the species habitat preferences/requirements based on scientific literature and information from site specific information. It also describes the environmental baseline and relevant habitat components that may or may not be affected by the alternatives if they were implemented. The information in this section is based on scientific literature, district wildlife atlases, professional judgment, and findings of stand information collected in the field.

An important concept in the existing condition descriptions and analysis is the difference between *capable habitat* and *suitable habitat*. The following definitions are helpful in distinguishing between these two terms and the concepts they are based on.

Capable habitat: Refers to the inherent potential of a site to produce essential habitat requirements of a species. The vegetation on the site may not be currently suitable for a given species because of variable stand attributes such as inappropriate seral stage, cover type or stand density.

Suitable Habitat: Wildlife habitat that currently has both the fixed and variable stand attributes for a given species' habitat requirements. Variable attributes change over time and may include seral stage, cover type, stand density, tree size, stand age, or stand condition.

Threatened, Endangered and Proposed Species

Gray Wolf. Wolves are highly social animals requiring large areas to roam and feed. Conservation requirements for wolf populations are not fully understood, but the availability of prey and limiting risk of human-caused mortality are considered key components (USDI 1987, Tucker et al 1990). The risk of human-caused mortality can be directly related to the density and distribution of open roads.

Reference Condition: The northern Rocky Mountain wolf (a subspecies of the gray wolf) was listed as Endangered in 1973. However, based on enforcement problems and a trend to recognize fewer subspecies of wolves, the entire species was listed as Endangered throughout the entire lower 48 states, except Minnesota, in 1978 (USDI 1987). In the past, substantial declines in numbers of wolves resulted from control efforts to reduce livestock and big game depredations. By the 1940's, the Rocky Mountain wolf was essentially eradicated from its range.

In 1994, final rules in the Federal register made a distinction between wolves that occur north of Interstate 90 and wolves that occur south of Interstate 90, in Idaho. Gray wolves occurring north of Interstate 90 are listed as Endangered species and receive full protection in accordance with provisions of the Endangered Species Act. Gray wolves occurring south of Interstate 90 are listed as part of an experimental population, with special regulations defining their protection and management.

Existing Condition: The Douglas-fir beetle project on the Priest Lake RD occurs north of Interstate 90. The project area is outside of lands designated for wolf recovery, but lies within the general region that provides linkage between recovery areas. Occasional sightings have been reported in and around the project area. However, these sightings seem to indicate transient individuals or lone wolves, detached from a resident pack. There are no evidence of resident wolf packs (i.e. lack of sightings or observations of reproduction, den sites and rendezvous sites) in proximity to the project area.

Approximately 16 reports of wolves have come from within or adjacent to the project area. The majority of these reports were of animals sightings, while two consisted of tracks only and three consisted of both tracks and sightings. Follow-up surveys were conducted and documented. The majority of the sightings consisted of single animals, however, there have been some multiple animals sightings. One group of three or more animals was reported and verified within the project area on January 25, 1994. On January 31, 1994 a male wolf was killed adjacent to the project area as a result of efforts targeted for coyote control. This animal was believed to be traveling with another wolf at that time.

Wolves primarily feed on ungulates. The project area supports moose, elk, white-tailed deer and mule deer as potential prey items. Although no specific population numbers are available, ungulates are common and available enough to provide an ample prey base for wolves. Currently, prey populations are not limiting wolf recovery in the Selkirk Mountains.

Rationale for No Further Analysis: The influences of the Douglas-fir beetle outbreak has had minimum effect on winter cover conditions for white-tailed deer (primary prey species). Three analysis areas show no change in suitable winter range conditions. The remaining analysis areas (i.e. Lower West Branch and Quartz-Jasper) show less than a one percent change in suitable winter range conditions. These conditions remain unchanged

under all alternatives. Consequently, white-tailed deer populations would be unaffected because there would be no measurable changes in habitat quality or quantity as a result of the proposed action.

Open road densities would decline through implementation, reducing the risk of human-caused mortality and improving security for ungulates. The maintenance of an adequate prey base and reducing open road densities would adequately continue to provide for wolves and their habit12at. Therefore, this project may affect, but would not likely adversely affect gray wolves or their habitat. No further analysis and discussion is warranted (refer to the Biological Assessment, project file).

Woodland Caribou. The population is generally found above 3000 feet elevation in the Selkirk Mountains in Engelmann spruce/subalpine fir and western red cedar/western hemlock forest types. They are highly adapted to upper elevation boreal forests and do not occur in drier low elevation habitats except as rare transients. Seasonal movements are complex in this population and normally occur as altitudinal patterns moving to traditional sites for different seasons. The population is threatened by habitat fragmentation and loss, and excessive mortality from predators and illegal human take (USDI 1993).

Reference Condition: The Selkirk caribou population was emergency listed as Endangered in 1983 and a final ruling of its status appeared in the Federal Register in 1984 (USDI 1994). The recovery area for the population resides in the Selkirk Mountains of northern Idaho, northeastern Washington and southern British Columbia, Canada.

As part of the plan for recovery, caribou were augmented into the ecosystem from source populations in British Columbia between 1987 and the present. By 1990, the population was increased to approximately 55 to 70 animals. The population remained somewhat stable through the early 1990's but a decline in numbers occurred in 1996 and was believed to be the result of increased rate of predation and other factors. Caribou numbers vary annually, and have been regularly followed with annual censuses and monitoring of radio-collared animals.

Existing Condition: The proposed actions are outside areas designated for recovery. Nevertheless, winter recreational activities, such as snowmobile activity, could be displaced to areas outside of the project because of possible winter logging conflicts with groomed snowmobile trails. It is anticipated that a portion of this displacement could occur on existing groomed routes and play areas within the recovery area. Currently, winter recreation use on these routes and play areas is considered high. Consequently, habitat effectiveness for caribou has been reduced within a zone of influence of these activities.

Rationale for No further Analysis: There would be no direct effects to caribou or its habitat because the proposed actions are located outside the designated recovery area. The possible displacement of winter recreation activities may increase use within the recovery area. However, this use would be minor and temporary, and would not increase the displacement effect beyond that which is already occurring. Consequently, habitat effectiveness would not change from existing condition. No other cumulative effects are expected. For these reasons, the Douglas-fir beetle project may effect, but would not likely adversely affect woodland caribou or its habitat. No further analysis and discussion is warranted (refer to the Biological Assessment, project file).

Bald Eagle. Bald eagles are winter visitors and year-long residents of northern Idaho and northeast Washington. They are attracted to the area's larger lakes and rivers which provide most of their foraging opportunities (e.g. fish, waterfowl). Accordingly, bald eagles select isolated shoreline areas with larger trees to pursue such activities as nesting, feeding, loafing, etc. Nesting habitat include proximity to sufficient food supply, dominant trees, and within line-of-sight of a large body of water (often within 0.25 mile of water). Nest trees typically are large ponderosa pine, Douglas-fir, western larch or cottonwood trees with open crowns in areas that are relatively free from human disturbance (Montana Bald Eagle Working Group 1991).

Reference Condition: All of the area covered by this EIS is included in Zone 7 as designated in the Pacific States Bald Eagle Recovery Plan (page 29). At the time of federal listing, bald eagles were uncommon in this zone. Key recovery areas in northern Idaho have contributed enough new territories to reach and exceed goals listed in the Recovery Plan. Originally, there was a target of two additional territories over and above the existing two territories in the Pend Oreille Lake/River area. Today, there are at least 10 territories within this area, including one known territory associated with Priest Lake. This territory is approximately 7 air miles from the project area.

Existing Condition: Winter roosts are relatively uncommon in the Idaho Panhandle. The majority of wintering eagles leave their nesting areas and congregate on unfrozen open water because of forage availability. These include Lake Pend Oreille, Pend Oreille River, Kootenai River, and Lake Coeur d'Alene. Only a limited number of winter roost sites are known in this entire area, despite annual aerial winter counts. The highly vegetated shorelines are likely to provide adequate protection such that habitual roosts appear to be generally unnecessary. Of the three known roosts associated with Lake Coeur d'Alene, two roosts are within 0.5 miles, and one is 1 mile from the associated water body (pers. comm. with S. Robinson, BLM wildlife biologist, to S. Jacobson, April 14, 1999). Of the three know winter roost sites associated with Lake Pend Oreille, two sites are less than 0.1 mile from shoreline and the other is approximately 0.1 mile from shoreline (Crenshaw 1987). Eagles are known to winter in small numbers in the Priest Lake Basin. Only two sites are known to have habitual eagle use, and these are limited to one or two individuals. Observed use is in trees immediately adjacent to the water.

Rationale for No Further Analysis: Nesting, feeding and roost areas are being protected on National Forest Lands through implementation of Forest Plan standards in accordance with the Pacific Bald Eagle Recovery Plan and the Montana Bald Eagle Management Plan.

There are no known nest territories or winter roosts associated with the proposal. There would be a low probability of impacts to bald eagles or their habitat. All proposed treatment areas are detached or removed from the shoreline areas of Priest Lake and Priest River. However, there are 6 units within a quarter mile distance of the Priest River shoreline. Nevertheless, recent nest searches failed to provide any evidence of nesting in and around these units.

Priest Lake Ranger District is heavily vegetated with many large trees, particularly around the lakes. This abundant cover provides ample nesting and winter roost habitat that is protected from the prevailing winds, both from topographically and tree density. It is unlikely that eagles would travel far from Priest Lake or Priest River because of the abundance of habitat near the primary food source.

Based on evidence presented, these forested shoreline areas are most likely to be used by eagles. It is unlikely that they would travel large distances from associated bodies of water to nest or roost. If roosts are located during project implementation, appropriate measures would be taken to protect the integrity of these sites (see Conservation Measures). There would be no cumulative effects expected. For these reasons, the Douglas-fir beetle project may effect, but would not likely adversely affect bald eagles. No further analysis and discussion is warranted (refer to the Biological Assessment, project file).

Grizzly Bear. Populations of grizzly bears persist in those areas where large expanses of relatively secure habitat exist and where human-caused mortality is low. Grizzly bears are considered habitat generalists, using a broad spectrum of habitats. Use patterns are usually dictated by food distribution and availability combined with a secure environment. Grizzlies commonly choose low elevation riparian areas and wet meadows during the spring and generally are found at higher elevation meadows, ridges, and open brush fields during the summer. During the late summer and fall, mesic timber habitat types become increasingly important for bears (Volson, 1994).

Reference Condition: The grizzly bear was listed as Threatened in 1975. The bear was originally distributed in various habitats throughout western North America. Today, it is confined to less than 2 percent of its original

range, represented in five or six population centers south of Canada, including the Selkirk ecosystem. Habitat loss and direct and indirect human-caused mortality is related to its decline (USDI 1993).

Noted naturalist Murie commented that the Priest Lake Area was one of the last strongholds for grizzly bears within northern Idaho (Layser 1978). Although it is unclear, it can be gleaned from this historical information that grizzly bears were undoubtedly more plentiful in the past than they are today. From the arrival of the first settlers into the area through the late 1970's, human access into areas occupied by grizzly bears has steadily increased, precipitating an increase in the frequency of human/bear encounters. These encounters have resulted in the death of some grizzly bears. The population estimate for the entire Selkirk ecosystem is unknown, but between the years 1985-1990, 26-36 bears were known to occur within a study area that composed approximately one-third of the ecosystem (USDI 1993).

Existing Condition: The proposed project includes parts of the Kalispell-Granite and Lakeshore Bear Management Units (BMUs) of the Selkirk Ecosystem. Also affected are areas outside of the recovery area where isolated pockets of high quality grizzly bear habitat are located or where reliable sightings have occurred. Sightings of grizzly bears have occurred within the last 10 years within most of the these watersheds.

Since 1966, approximately 55 reports of grizzly bear use of the Kalispell-Granite and Lakeshore Grizzly Bear Management units and adjacent area have been documented. Most reports consist of sightings. Eleven of these reports were gained from radio location of collared animals. On or about October 31, 1993, an illegal mortality of a female grizzly bear with two cubs was recorded. It is assumed that the yearling cubs died as a result of exposure following the females death. In October, 1995, a subadult male grizzly bear was live trapped after repeated confrontations with humans and habituating to human foods. This bear was relocated out of the area, returned and was illegally killed by a black bear hunter within the Kalispell-Granite bear unit.

Two radio collared grizzly bears have had known use patterns within this bear management unit. A female bear #867, the first grizzly bear radio collared in the Selkirks, was first commonly located within this unit, and was often accompanied by cubs. Bear #962, a male, was known to utilize the project area from 1985 when he was first captured until 1987 when his radio collar became inactive.

Controlling/directing motorized access has been one of the most important tools in managing for grizzly bear recovery. By managing motorized access, certain objectives can be achieved including, minimizing human interactions and potential grizzly bear mortality, reducing displacement from important habitats and minimizing habituation to humans. The Selkirk/Cabinet-Yaak subcommittee (1998), at the request of the Interagency Grizzly Bear Committee, has developed an interim access management strategy to address impacts related to motorized access, until Forest Plans are revised. This strategy includes achieving specified levels of security (habitat effectiveness) and core habitat, depending upon priorities of Bear Management Units (BMUs).

The Kalispell-Granite BMU totals 85,642 acres and is one of the nine designated grizzly bear management units within the Selkirk Recovery Area. Grizzly bear habitat security within this BMU is achieved through road restrictions on over 25 road systems. Four of the road systems have restrictions which are only implemented seasonally. Currently within this BMU, security resides at 80.7 percent during the spring season (March 15 - June 30), 72.4 percent during the summer season (July 1 - September 10) and 77.4 percent during the fall season (September 11- November 15). The criteria for a minimum level of security habitat for this BMU has been established at 70 percent and to achieve a no net loss of existing core habitat (USFS, 1995). Currently, 44.2 percent of the BMU is considered and managed as core habitat for grizzly bears.

The Lakeshore Grizzly Bear Management Unit totals 17,972 acres and is situated between Priest Lake and the Kalispell-Granite BMU. In comparison, it is the smallest of the BMUs in the Selkirk Ecosystem. Its eastern boundary with Priest Lake is highly developed with summer homes, resorts, campgrounds, etc. which make grizzly bear habitat maintenance and improvement unattainable in this area. Currently, security is

maintained at 27.6 percent for the spring, summer and fall seasons. 16.6 percent of the BMU is classified as core habitat. For the Lakeshore BMU where it is not feasible to achieve similar security and core objectives because of landownership patterns, the criteria for managing this BMU would be to achieve a no net lost of existing security and core habitat.

Lynx. Lynx occupy regions in North America of arctic or boreal influence. They are restricted to forested habitats within this region and are found from western Alaska to the eastern edge of New Foundland. The northern boundary of this range coincides with the northern extension of the boreal forests. The southern boundary of lynx range is along the high elevation or boreal forested areas of the Cascades and Rocky Mountains into Washington, Idaho, Montana, Wyoming, Colorado, and Utah.

Lynx are considered low density species with home ranges averaging 24 square miles, depending on prey abundance. They occur primarily in moist, cold habitat types above 3,000 feet elevation on the Priest Lake project (Weaver personal communication 1998). Even though lower elevations can be important in some instances, evidence suggests lynx tend to use these areas less because of competition with other predators and overheating in the summer.

Important risk factors that can impact lynx populations include high open road densities and alterations to foraging and denning habitat. Roads are directly correlated with human access, and consequently lynx vulnerability to trapping and shooting (especially during the winter season).

Lynx habitat in the western mountains consists primarily of two structurally different forest types occurring at opposite ends of the stand age gradient. Lynx require early successional forests that contain high numbers of prey (especially snowshoe hare) for foraging and late-successional forests that contain cover for kittens (especially deadfalls) and for denning (Koehler and Aubrey in Ruggiero et al., 1994, p. 86). The highest use occurs when these are in close proximity. Like most wild cats, lynx require cover for security and stalking prey; they avoid large open areas. Although lynx may cross openings less than 100 meters in width, they generally do not hunt in these areas (Koehler and Aubrey in Ruggiero et al., 1994, p. 88). Lynx tend to avoid continuously steep, dissected areas.

Reference Condition: The lynx is one of the three species of wild cats that occur in the temperate forests of North America. Lynx populations in Alaska and most of Canada are generally considered stable to slightly dropping. The conservation of lynx populations is the greatest concern in the western mountains of United States because of the peninsular and disjunct distribution of suitable habitat at the southern periphery of the species' range. Both historic and recent lynx records are scarce, which makes identifying range reductions and determining the historical distribution of stable populations in the region difficult (Koehler and Aubrey in Ruggiero et al., 1994, p. 79).

Existing Condition: Lynx have been documented within most of the analysis areas being considered with the exception of the Quartz Analysis Area. High quality suitable habitat is distributed throughout much of the proposed project areas. Older, multi-layered forests with a good understory component of shrubs and trees can also provide lynx foraging opportunities. Although it is noted that lynx rely heavily on snowshoe hare as a primary food source, it is believed that within portion of the project area that other species may play an important role in lynx ecology such as red squirrels and grouse.

On July 8, 1998, the U.S. Fish and Wildlife Service published a proposal to list the lynx under the Endangered Species Act of 1973, as amended. In effort to address management of lynx, the following protocols are used as the most current information to evaluate effects on lynx habitat and facilitate Section 7 conferencing and consultation with U.S. Fish and Wildlife Service:

- *Within lynx habitat, no more than 30 percent of lynx habitat can be within a preforage habitat condition at any time. Management activities would not change more than 15 percent of lynx habitat into a preforage condition within a 10 year period.*
- *Within a lynx habitat, maintain denning habitat on a least 10 percent of the area that is capable of producing stands with these characteristics. Denning habitat should be well distributed and in patches larger than 5 acres.*
- *Manage for no net increase in open road miles in lynx habitat. Allow no net increase of regularly used or groomed over-the-snow routes and play areas.*
- *Maintain vegetative structure that facilitates movement of lynx along important connectivity corridors (e.g. riparian areas, saddles, ridges).*

Sensitive Species

Black-backed Woodpecker. Black-backed woodpeckers are uncommon, year-round residents of coniferous forests where they naturally occur at low population levels. They experience local population increases and temporary range extensions resulting from fire or insect/disease outbreaks that might increase populations of wood-boring insects. They excavate cavities and nest in dead and dying trees. Limiting factors for survival include fire suppression and activities that substantially reduce the dead and decaying component in their habitat (USDA 1992).

Rationale for No Further Analysis: The Douglas-fir beetle outbreak has created favorable habitat conditions that has allowed black-backed woodpecker populations to expand beyond the current endemic low levels. The removal of some of the pockets of infestation would temper this expansion, however, populations would remain above existing levels. Consequently, the project design and mitigation measures, combined with the natural progress of the beetle outbreak would continue to support populations of black-backed woodpeckers at expanded levels.

The project is designed to maintain at least the minimum number of snags needed to support woodpecker populations. These guidelines would retain snags in treatment areas that are in addition to the large number of snags that are being created, but not removed, by the Douglas-fir beetle across the Priest Subbasin as well as northern Idaho and northeastern Washington.

Currently, there is an additional 3,753 high risk acres that would not be treated by the proposed actions on the Priest Lake Ranger District (see map depicting high risk areas outside Alternative D units). Of these 3,753 acres, there are 50 patches between 50-100 acres in size, 19 patches that are between 100-200 acres in size and 10 areas that are greater than 200 acres in size. In addition, there are other areas that have gone undetected. It is expected that the beetle outbreak would continue to expand and create additional pockets and areas with high snag densities.

Natural snag recruitment is also occurring. This recruitment is primarily in the smaller size classes of snags, which are used more by black-backed woodpeckers than some other species dependent on larger snags (see pileated woodpecker and white-headed woodpecker accounts). For these reasons, it is unlikely the project would have negative consequences on existing populations of black-backed woodpeckers. Therefore, no further discussion and analysis is necessary.

Boreal toad. Boreal toads require shallow water in ponds, lakes or slow-moving streams for breeding sites. Boreal toads lay their eggs in the warmest water available, typically less than 20 inches deep (Corkran & Thoms, p. 86 1996). Beaver ponds are often used for breeding. This species does not require much aquatic or emergent vegetation in its breeding habitat. After the brief spring breeding season, adult toads leave aquatic habitats and travel to a variety of upland habitats. Radiotelemetry research on boreal toads in southern Idaho found that toads can travel up to 2 kilometers (about 1 mile) from their natal ponds; it also showed that toads avoided crossing clearcuts (Bartelt 1994). Boreal toads in Colorado have been documented traveling up to 2.5 miles away (Loeffler 1998).

Tadpoles take at least 2 months to develop before they grow into juvenile toads and disperse from the breeding site into nearby upland habitats. Juveniles disperse from their natal ponds in late summer. The timing of dispersal depends on water temperature; in warmer water, tadpoles and juveniles mature faster. Much of the year toads are away from ponds in terrestrial forest and non-forest habitats. Toads hibernate in the winter in habitats which maintain a high humidity and above-freezing temperatures. It is important that toads be able to move among their seasonal habitats. According to Nussbaum et al. 1983, p. 128, optimal habitat probably has moderate to dense undergrowth in more humid regions. The biggest potential barrier to their movements is roads. Steep roadcuts can be a barrier to toads moving between seasonal habitats. Juvenile toads are vulnerable to being killed by motorized vehicles when they are dispersing from their natal ponds.

Rationale for No Further Analysis: Preliminary analysis shows that Inland Native Fish Strategy guidelines concerning riparian habitat conservation areas within 150 ft. of the edge of wetlands would prevent sedimentation of toad breeding habitat. Road removal or improvement would benefit toads by eliminating a potential sediment and mortality source near the wetland. It was determined that there were adequate design criteria and mitigation measures to protect boreal toads and their habitat. Therefore, no further analysis and discussion is warranted.

Fisher. (Also see American marten discussion under management indicator species.) Fisher are medium-sized mammalian carnivores. They tend to be opportunistic predators, eating anything they can catch. Their major prey tend to be small to medium sized mammals, birds, and carrion. Fishers are found only within North America and presently occur from southern Canada south into the northwestern states, California and the Great Lake States. Fishers occur most commonly in landscapes dominated by mature to old forest cover. Within the Pacific states and Rocky Mountains they appear to prefer late-successional coniferous forests in the summer and mid to late-successional forests in winter.

Fishers prefer habitats with high canopy closure (greater than 80 percent) and avoid areas with low canopy closure (less than 50 percent), Powell 1982. They also have been known to use riparian areas disproportionately more than their occurrence. In north-central Idaho, grand fir and spruce forests were preferred by fishers (Jones 1991) and elevations from approximately 3000 to 5000 feet were used. The habitat requirements of fishers are thought to be more associated with the physical structure of the forest and associated prey. This structure includes the vertical and horizontal complexity created by a diversity of tree sizes and shapes, light gaps, dead and downed wood and the layers of overhead cover. Large diameter spruce and grand fir snags and large downed material are used for denning and foraging. Fishers tend to avoid non-forested areas. The home ranges for fishers vary with prey densities. Studies indicate that the mean home range for adult males is 40 square kilometers; this is nearly three times that of females, which is 15 square kilometers.

Fishers tend to avoid human presence and generally are more common where the density of humans is low and human disturbance is low. Fishers are easily trapped. Where populations are low, fisher populations can be jeopardized by the trapping of coyote, fox, bobcat and American marten (Powell & Zielinski in Ruggiero et al. 1994 p. 63). Habitat security, in the form of low road densities, reduces the risk of this occurrence because trapping areas are limited.

Reference Condition: No accurate estimates or records exist for historic wildlife populations, including American marten and fisher, for the geographic assessment area. Historic records do indicate that furbearers, including these two species, were trapped in the area (Lindsley 1889). It would be reasonable to infer the numbers of animals were greater than what occurs currently given the number of records within the last 10 years in the Geographic Assessment area.

Extensive alteration of forest structure as a result of natural and human-caused disturbances (i.e. reduction in canopy closure, snags, and down woody material) has altered the habitat value for fisher and marten. Generally, the openings created by human development and timber harvesting have reduced denning habitat value, whereas, the increase in canopy cover brought about by fire suppression has expanded denning habitat quality.

To provide for high integrity fisher habitat within a watershed area, at least 45% of the capable fisher habitat should be classified mature and older forests (suitable denning habitat). Mature and older forests provide for higher amounts of dead and down material that support prey species. Moderate integrity fisher habitat would maintain 40-45% of the capable fisher habitat as suitable denning habitat. A watershed area with less than 40% of the capable as suitable denning would be rated as low integrity habitat for fishers. Also, open road densities should be managed below 2 miles of road per square mile of area to reduce vulnerability or risk to mortality (Heinemeyer and Jones 1994).

Existing Condition: Fishers are considered rare throughout most of Idaho. Foraging habitat is included in denning habitat, but fishers can also use areas of lower seral stages to forage as well. A low percentage of the capable primary habitat is in currently suitable habitat. These stands are currently unsuitable for a variety of reasons, including having too small trees, trees of the wrong species (pending succession into more favorable species), or too few trees per acre. A disproportionate amount of the capable but currently suitable habitat is along the lower portions of the drainages, which are the better sites for fisher based on topography and elevation. Most of these sites are not currently suitable because of the species of trees currently occupying the sites (i.e. seral larch on a cedar/hemlock habitat type). Nevertheless, there is adequate fisher habitat to support fishers in the project area.

Flammulated owl. (Also see White-headed Woodpecker discussion later in this section.) Flammulated owls are seasonal migrants that occupy home ranges in the northern latitudes during the spring, summer and fall. They are cavity nesters that depend upon naturally occurring or excavated cavities for nesting. Consequently, snags and other defective trees are an important component of their breeding habitat.

These owls are attracted to relatively open, older forests featuring ponderosa pine and Douglas-fir that are correlated with drier habitats. Reynolds and Linkhart (1992, p. 166) reported that all published North American records of nesting, except one, came from forests in which ponderosa pine was at least present, if not dominant. The flammulated owl's preference for ponderosa pine and/or Douglas-fir can also be linked to prey availability. Reynolds and Linkhart noted a stronger correlation between prey availability and ponderosa pine and Douglas-fir, than with other common western conifers (1992, p. 168).

Reference Condition: No population numbers exist for this species' historic condition. However, a geographic assessment of the Priest Lake subbasin determined that the historic amounts of dry site large/mature and old growth ponderosa pine and Douglas-fir were much more numerous than currently. This is due to several reasons. Low intensity wildfires that maintained these stands in suitable conditions for flammulated owls have been essentially eliminated by aggressive fire exclusion. Timber harvesting has fragmented stands into smaller patches. These lower elevation, low gradient areas are also suitable for human development. These factors have dramatically reduced the amounts of suitable habitat for this species. There are no standards are available to determine how many flammulated owls are adequate to maintain population viability for a given planning unit.

Existing Condition: Flammulated owl habitat is widespread, disjunct and uncommon in the analysis areas. Flammulated owls in the Priest Lake subbasin tend to occur in small areas of suitable habitat within larger stands of less suitable habitat, as well as larger areas of suitable habitat. Most of the observations have been of several individuals rather than single birds. Because they are a dry site species, most of the habitat in the Priest Lake subbasin is concentrated in the lower elevations of the analysis areas, primarily in the Flat Goose areas of Lower West Branch, and Tola Ridge in the Binarch-Lamb analysis areas. The most northern analysis area, Lakeface-Granite, has the least amount of habitat in substantial patches, and the patches are disjunct.

Flammulated owls are present in the four southern analysis areas (Binarch-Lamb, Upper and Lower West Branch, and Quartz), according to surveys done during breeding season in the recent past. The Upper West Branch analysis area contains modest quantities of capable and currently suitable flammulated owl habitat. Suitable and capable habitat is concentrated in the lower elevations and the eastern perimeter of the area on southwest aspects of Tola Ridge. Flammulated owl observations have occurred within several treatment area units along Tola Ridge (Priest Lake wildlife atlas files). The Lower West Branch analysis area is a large area containing habitat concentrations in two areas: in the Flat Goose area and the Quartz Jaspar area west of Priest River.

The proportion of currently suitable habitat within all of the analysis areas (584 acres) compared to the area capable of producing suitable habitat in the future (10,230 acres) is quite low. These numbers underestimate the amount of capable and suitable habitat present for several reasons. Because stand exams are weighted averages of the physical (i.e. slope) and biological (i.e. habitat type) features, microsites or variations in habitats that have value for flammulated owls are not always detectable. For example, the habitat type of any stand is based on the number of plots taken in the field exam. The stand habitat type doesn't reflect microsites of other habitats that may be present and would support flammulated owls. However, the trend of the analysis is still considered valid because the results of the modeling are consistent with what would be expected.

The primary reasons that capable habitat is currently unsuitable are small tree size, high canopy cover, or a low density of large trees. Stands that are unsuitable because of small tree size or a low density of large trees have the greatest likelihood of growing into suitable habitat given adequate time, particularly if low intensity ground fires reduce competition in the stands. Stands that are unsuitable because of a high canopy cover would not become suitable given time alone, but would require some disturbance such as beetles, wildfire or mechanical removal (such as from timber harvesting).

Harlequin duck. Harlequin ducks are rare, seasonal residents of whitewater streams in the northern Rockies. They are small sea ducks that winter in coastal areas and migrate hundreds of miles inland to northern Idaho, western Wyoming and western Montana to breed and rear young. Harlequins arrive in Northern Idaho between March and May. After nesting begins in mid-May the males migrate back to the Pacific coast. Nesting continues through July, with the females rearing the young through late August or September, after which they return to the coast for the winter (Cassirer and Groves 1991, p. i, USDA 1992).

Harlequins nest along clear, clean, swiftly flowing remote mountain streams located away from concentrated human activities. In northern Idaho these streams are usually associated with mature to old-growth western red cedar/western hemlock or spruce/fir forest stands (Cassirer and Groves, 1991, p. ii). Nesting habitat includes very low gradient stream sections with braided channels, intact riparian areas with dense stream-side shrub growth, and rich aquatic insect populations (Cassirer and Groves, 1991, p. 7). Turbulent stream sections are used for security and feeding.

The presence of harlequin ducks is considered an indicator of high water quality (USDA 1992). Management activities that impact stream quality, including those that could increase water yield beyond the stream's capability, have the potential to impact this species. Water quality standards relative to harlequins are primarily to protect their invertebrate food base and maintain hydrologic function. Harlequin ducks can also

be affected by disturbance within approximately 200 feet (depending on density of streamside vegetation) of a nesting stream.

Rationale for No Further Analysis: Granite Creek is the only mountain stream that has reported observations of harlequin ducks. None of the proposed actions would alter riparian habitat (see Inland Native Fish Strategy guidelines in Chapter II). No new roads or trails are expected to be within 200 feet of Granite Creek or any other suitable harlequin duck nesting stream.

Water quality is expected to improve under all action alternatives (see the Watershed section for detailed discussion on water yield). Timber harvest activities are designed to reduce risk to long term risk to Granite Creek and its tributaries. Harvest and watershed restoration activities may increase sediment in localized areas (i.e. culvert removal), but no measurable effect is expected to Granite Creek. Road related activities associated with the proposal would reduce existing risks to Granite Creek Water Quality. For these reasons, the risk factors to harlequins have been avoided or mitigated through design features. Therefore, no further analysis and discussion is warranted.

Northern bog lemming. Bog lemmings inhabit moderate to high elevation wet meadows, fens/bogs, alpine sedge meadows, Krummholz, spruce-fir forest with dense herbaceous and mossy understory, and mossy streamsides. This small mammal is representative of a restricted habitat that is very limited in the contiguous United States. While its habitat supports several other wildlife species, the sensitive or unique species that have been identified are mostly plants. Because of the scarcity of these habitats and the relative small size of the sites, they may be easily destroyed. Therefore, their monitoring and protection is essential to maintain the viability of the dependant species. They appear to be associated with alpine or sub-alpine habitats but they have been found in moist cedar/hemlock habitat on Priest Lake Ranger District.

The biggest threats to this species' habitat are activities which would dry out or damage the vegetation (trampling, compaction etc.) where this species lives. These could include timber harvest, livestock grazing or recreation use. Snowmobiles and skiers could compact the snow, creating barriers which would restrict the lemmings' movement over ground under the snow. Riparian/wetland Best Management Practices (BMP's) and Inland Native Fish Strategy guidelines would help protect habitat for this species during road building, logging and grazing where it occurs near perennial streams.

Rationale for No Further Analysis: Management recommendations for this species would be the same regardless of whether they were present or not. Interim management recommendations for Montana include avoiding habitat disturbing activity within 100 meters of sphagnum mats or associated streams and wetlands and minimizing domestic livestock grazing in drainages with sphagnum mats present (Reichel and Beckstrom 1993 p. 23-24). Wetland protection measures, including project design features for fisheries and Sensitive plants would also cover the needs of the lemmings. Therefore, this species would not be analyzed further in this assessment because design criteria would adequately protect its habitat.

Northern Goshawk. Northern goshawks are large forest hawks and occur in northern Idaho year-round, although they are more uncommon in winter. Goshawks are indicators of mature and old growth habitats such as park-like stands featuring a dense overstory of large trees and an open understory of grass or low shrubs. They are adapted to live in these forest stands and feed primarily on small mammals and birds (Warren 1990 p. 20). Northern goshawks avoid large open areas due to competition from red-tailed hawks and great horned owls (Crocker-Bedford and Chaney 1988; Reynolds 1983), and because of their secretive hunting strategies.

Reference Condition: Much of the historic conditions noted for flammulated owls apply to northern goshawks as well. Historic numbers of goshawks were likely higher than they are today, because many of the species they prey upon were likely more numerous. This is because the habitat of their primary prey species was more plentiful than today. The draft Geographic Assessment for the Priest Lake area for forest structure indicates a greater proportion of old growth was present in the Priest Lake subbasin than currently occurs.

Old growth is important for northern goshawks not only for prey species habitat but also for the large trees that provide the substrate for their substantial nest structures.

Another factor influencing the amount of goshawk habitat is the amount of understory vegetation that this generally mesic area produces. Because northern goshawks require a combination of adequate understory to provide prey species, and adequate clearance for flight maneuverability, some stands that historically were suitable for foraging are no longer suitable because of increased density of understory.

At least three suitable nest areas should be provided per home range (5,000-6,000 acres) to provide long-term nesting habitat for goshawks on the landscape. The minimal stand size for goshawk nest sites is 30 acres, with all nest sites best located within 0.5 mile of each other (Reynolds, et al. 1992). Post-fledging areas have not been an issue on the IPNF because nesting habitat, not foraging habitat, appears to limit the numbers of goshawks on the IPNF. In this document, post-fledging areas would be considered the most suitable 400 acres around known territories, or territories located in this project.

Existing Condition: Northern goshawk habitat is widespread and abundant in the Priest Lake subbasin, and on the North Zone GA area. As with most species, capable habitat is much more abundant than currently suitable habitat, with a total of 86,940 acres of capable and 40,830 acres of currently suitable. The models tend to underestimate the amount of suitable habitat within stands that have microsites that goshawks are known to successfully use on the North Zone. However, the queries used in the Final EIS likely overestimate the total amount of stands goshawks would successfully use because the canopy closure is generously inclusive.

Suitable habitat is almost twice as common as reported in the Draft EIS for several reasons. Because there are some exceptional cases of goshawks nesting in stands with canopy closures as low as 40%, the canopy cover requirement in the habitat relationships were revised to include stands with canopy closures as low as 50% (most known goshawk territories in the North Zone are not in stands with canopy closures easily above 50%). This change resulted in a large number of additional acres because the Priest Basin has few stands that are less than 50% unless they are early seral stages, or have had major harvest treatments. Secondly, a change in data base query to comply with this change simplified the process by selecting stands that had no recent regeneration harvesting or other activity which would have resulted in a lower canopy closure. This practical approach likely overestimates the amount of suitable habitat, but is probably a reasonable approximation if the canopy closure requirement is 50%. Third, the use of canopy cover as a selective criterion in the Draft EIS probably underestimated the number of suitable stands relative to this second method, because it would not select stands with certain types of missing data. Overall, the numbers are reasonable for the Final EIS if it is assumed that goshawks can successfully nest in stands with 50% or greater canopy closure.

In the Priest Lake subbasin, some capable habitat is not currently suitable because of small tree size, low density of large trees, low canopy closure, or a high density of understory vegetation. Habitat with a low density of large trees or small trees can frequently grow into suitable habitat over time.

The large amount of suitable goshawk habitat indicated in the model results is confirmed by the number of known goshawk nesting territories. In the Lakeshore-Granite analysis area, there are two known territories; in Binarch-Lamb, one; in Lower West Branch, one; in Upper West Branch, two; and in Quartz, one plus the foraging area for another pair. These known sites are primarily the result of surveys only during project planning or incidental sightings, so it is highly likely there are other territories. The North Zone is well represented by northern goshawk territories as well, with over 25 known on the two other North Zone districts.

Northern leopard frog. This species occupies marshes, wet meadows, riparian areas and moist, open woods. Leopard frogs apparently require a moderately high ground cover for concealment (Nussbaum et al. 1983, p. 180). Because this species attaches its eggs to aquatic vegetation, it prefers ponds or lakeshores which have fairly dense aquatic and emergent vegetation during the spring egg-laying season. Breeding habitat typically

has water at least 20 inches deep (Corkran and Thoms 1996). This species probably hibernates in and spends all its life in and around ponds and lakes.

Rationale for No Further Analysis: Preliminary analysis shows that Inland Native Fish Strategy guidelines concerning riparian habitat conservation areas within 150 ft. of the edge of wetlands would prevent sedimentation of toad breeding habitat. Road removal or improvement would benefit toads by eliminating a potential sediment and mortality source near the wetland. It was determined that there were adequate design criteria and mitigation measures to protect boreal toads and their habitat. Therefore, no further analysis and discussion is warranted.

White-headed Woodpecker. The white-headed woodpecker is restricted to drier forest types dominated by pine trees in the mountains of far western North America. Abundance appears to decrease north of California. They are generally uncommon or rare in Washington and Idaho and quite rare in British Columbia.

Modern forestry practices including clear-cutting, snag removal and fire suppression have fragmented the forest and contributed to local declines of the species, particularly north of California (Kimball et al. 1996). However, this species persists in burned or cut-over forests with residual snags and stumps; thus populations are more tolerant of disturbance than those species associated with closed-canopy forest (Raphael et al. 1987).

Rationale for No Further Analysis: Because of habitat similarities with flammulated owl, the white-headed woodpecker would be treated as a guild with flammulated owl in this document.

Wolverine. Wolverines are low density, wide-ranging species that inhabit remote forested areas, ranging over a variety of habitats. Wolverines tend to use lower elevations in the winter and higher elevations in summer, when these areas provide the greatest potential for a food supply (Hornocker and Hash, 1981, pp. 1292-1296 and 1300).

Wolverine mortality associated with human/wolverine interactions is considered one of the primary limiting factors in wolverine populations. Improved access increases the potential for human/wolverine interactions, which can lead to shooting loss or incidental take by trapping (wolverines are occasionally taken by trappers focusing on other furbearers such as bobcat and American marten).

Other factors with the potential to threaten local population viability of the species include reductions of "wilderness refugia" (large areas of habitat with limited human access), natural reserves, or food availability (Hatler, 1989, in Butts, 1992, p. 32).

Rationale for No Further Analysis: Wolverines are likely to be transient in the area because of their wide ranging nature. Consequently, the risk of human/wolverine interactions would be relatively low. Security design features (access management) are likely to further reduce these interaction opportunites, thereby, lessen the mortality risk factors and provide adequate protection for an ungulate prey base. None of the project areas include suitable denning habitat, so the risk of disturbance during the sensitive rearing period is not a factor for this species. Based on this reduction in risk to the species, it is unlikely the project would affect wolverines. Therefore, no further analysis would occur for wolverine.

Management Indicator Species

American Marten. American marten was selected by the Idaho Panhandle Forest Plan (1987, Appendix L-3) as a management indicator species. It represents species using mature and old-growth habitats. Marten are closely associated with mature to old-growth timber stands, preferring moist habitat types where small mammals are more abundant. American marten prefer stands with greater than 40 percent canopy closure, and tend to avoid those stands with less than 30 percent closure (Warren 1990, Spencer 1981 in Warren 1990

p. 30). In addition to a closed canopy, marten require an abundance of large downed logs and snags. This provides secure resting locations, denning habitat and winter access to small mammals living beneath the snow (Patton and Escano in Warren, 1990, pp. 29-30). American marten are easily trapped and are highly vulnerable to overharvest in areas accessible by fur trappers. Because of habitat similarities with fisher, the American marten will be treated as a guild in this document with fisher.

Moose/Elk. Moose and elk occur in a variety of habitats but favor early successional stages especially during winter. Early seral stages are necessary for winter foraging, and cover is necessary for escape, thermal protection, and hiding. As browsers, particularly on succulent plants associated with mesic areas, they would tend to be more common outside of the drier proposed action units. Snow depth and harsh winters limit the available winter range in most of the rest of the Priest Subbasin.

Rationale for No Further Analysis: Although moose and elk are important game species on the Priest Lake Ranger District, the IPNF Forest Plan does not emphasize elk and emphasized moose only in the Kalispell basin area (the Priest Lake project area lies outside the Kalispell basin area). No specific habitat management guidelines are in the Forest Plan for elk or moose in the North Zone. Security habitat would be maintained by several of the design criteria, as well as many of the management considerations for grizzly bear habitat. None of the action alternatives would result in an increased road density at the end of the project, although some roads that are currently impassible would be opened temporarily in some of the action alternatives. Foraging habitat would be increased. Therefore, no further analysis and discussion is warranted.

Pileated Woodpecker. Pileated woodpeckers have specific requirements for nesting which make them appropriate indicators of old growth or late successional forest. They are year-round residents that prefer forests with tall, large diameter dead or defective trees for nesting. Nest cavities are usually located more than 30 feet above the ground. Pileated woodpeckers feed primarily on carpenter ants and other insects, excavated from deep within dead and decaying wood (Bull 1987, p. 472-479; Bull and Holthausen 1993, p. 13-19; Warren 1990, p. 10-17).

Because foraging habitat represents a wider ecological range of forest age structure, nesting habitat is considered the most critical and limiting feature for pileated woodpeckers. A pileated nesting area should be at least 100 contiguous acres with an overall canopy cover of at least 50 percent (Warren 1990, p. 16).

The limiting factors for pileated woodpeckers are generally considered to be large snags, for nesting, foraging, or roosting.

Rationale for No Further Analysis: Forest stands would not be reduced below the appropriate canopy cover (50 percent) for pileated woodpeckers if they have not already been reduced below that point by beetle activity. Also, the project is designed to maintain at least the minimum number of snags needed to support woodpecker populations, distributed uniformly across the landscape. The minimum number of snags left in any unit with a canopy closure greater than 50% would be adequate to maintain a distribution of snags across the landscape. No treatments are proposed that would reduce old growth structure or integrity where it occurs. For these reasons, it is unlikely the project would have measurable impacts on pileated woodpeckers. Therefore, no further discussion and analysis is necessary.

White-tailed Deer. White-tailed deer are very adaptable and prolific, and thrive in a variety of habitat types and seral stages. They are also tolerant to disturbances, such as agriculture and forestry practices, and prefer these areas if an adequate arrangement of cover and forage is available. Some of the largest white-tailed deer populations in Idaho occur in the Panhandle. In 1985, the Idaho Department of Fish and Game estimated that 99 percent of the State's population were found in the their two northern regions.

Historically, white-tailed deer flourished in the 1800s, but by the early 1900s their populations were reduced to low numbers due to over exploitation by trappers, miners and settlers. White-tailed deer populations have rebounded to a point where they are the most abundant big-game species in northern Idaho. Idaho Fish and

Game's 1986-1990 Statewide goals for white-tailed deer were changed from emphasizing increases in populations to maintaining populations, harvest, and recreational opportunities.

Climatic factors affect the seasonal variation of forage quality and quantity, accessibility to foraging areas and the energetic requirements to the animal (Pfingsten 1984). Winter is the most limiting and stressful period for big game. It is during this period when forage is scarce and travel is energetically very expensive because of snow accumulations. Consequently, in an effort to ameliorate conditions, deer are forced to concentrate on smaller, more confined areas known as critical winter range; generally found on the valley bottoms and lower benches. Approximately 15 percent of the project area is classified as critical winter range.

Thermal cover is probably the most important component of this winter habitat (thermal cover is the collective arrangement of tree crowns that help moderate the effects of inclement weather. It also intercepts snow and reduces understory snow accumulation, thereby, increasing foraging opportunities). As winter temperatures decrease and snow depths increase, animals select these areas to minimize energy expenditures (Pauley 1990). At least 50 percent of the canopy structure is needed to provide the attributes of thermal cover. Optimal proportion of thermal cover on the winter landscape should be 50-70 percent (Jageman 1984).

Rationale for no Further Analysis: The influences of the Douglas-fir beetle outbreak has had minimum effect on winter cover conditions. Three of the analysis areas show no change in suitable winter range conditions. The remaining analysis areas (i.e. Lower West Branch and Quartz-Jasper) show less than a one percent change in winter range conditions. These conditions remain unchanged through all other alternatives.

Typically, a decline in winter thermal cover involves a higher risk to white-tailed deer populations. In the event of severe winter conditions (e.g. above average snowfall and below normal temperatures) the risk of winter mortality becomes higher than under more normal conditions. However, a loss of this scale would most likely have little or no influence on deer's ability to fully utilize existing habitat conditions. Because white-tailed deer populations are prospering in north Idaho and the proposed actions would not change winter range conditions, the risks to individuals would be low. Consequently, no further analysis is necessary.

Other Species and Habitat

Boreal Owl. In March, 1999, the Northern Region (R-1) updated its Sensitive Species List. At that time the boreal owl was removed as a sensitive species for the Idaho Panhandle National Forests.

Boreal owls occur in spruce/fir forests and associated high elevation cedar/hemlock forests usually above 5,000 feet elevation. Mature and old-growth conifer forests are suitable for nesting and foraging; forests with pole size or larger trees are also foraging habitat (USDA 1992). Nesting occurs in cavities in large snags, at least 13 inches in diameter, that have been excavated by pileated woodpeckers and northern flickers (Hayward, 1989). Mature and old-growth stands provide habitat for red-backed voles, gophers and flying squirrels, all important prey species for the owl. Younger stands are also used as foraging habitat during non-breeding periods.

Home ranges for boreal owls vary in size, but may cover as much as 2,200 acres or more. Home ranges can overlap extensively, but only a small area around the nest is actively defended during the breeding season (Hayward, 1989).

Rationale for No Further Analysis: The proposed actions lie below the preferred spruce-fir zone for boreal owls. Therefore, because suitable habitat is not affected, this project would not impact boreal owls.

Forest Land Birds. Forest land birds include all the avian species sometimes collectively termed as 'neotropical migrant birds' and 'resident songbirds'. No birds in this guild are listed as a sensitive species. This group of birds is not treated separately by species because they are an extremely diverse group of species, with widely divergent habitat requirements. Any treatment, including no action, affects some species in this group at the expense of others. It would be impossible to treat all the individuals in this group separately. However, some species are represented by other species discussed, including dry site species (flammulated owl), riparian species (harlequin duck), early seral stage species (lynx), wetlands (Coeur d'Alene salamander, northern bog lemming and harlequin duck, old growth (flammulated owl, fisher, pileated woodpecker and northern goshawk), and snag dependent species (pileated, white-headed and black-backed woodpeckers).

Rationale for No Further Analysis: Maintaining or trending habitats toward their historical range of conditions is presumed to provide for most habitat needs of the birds that have adapted to the Priest Lake subbasin's ecosystem. Because of the detailed analysis for other species (discussed above) that share similar effects, species in this group would not be further analyzed in this document.

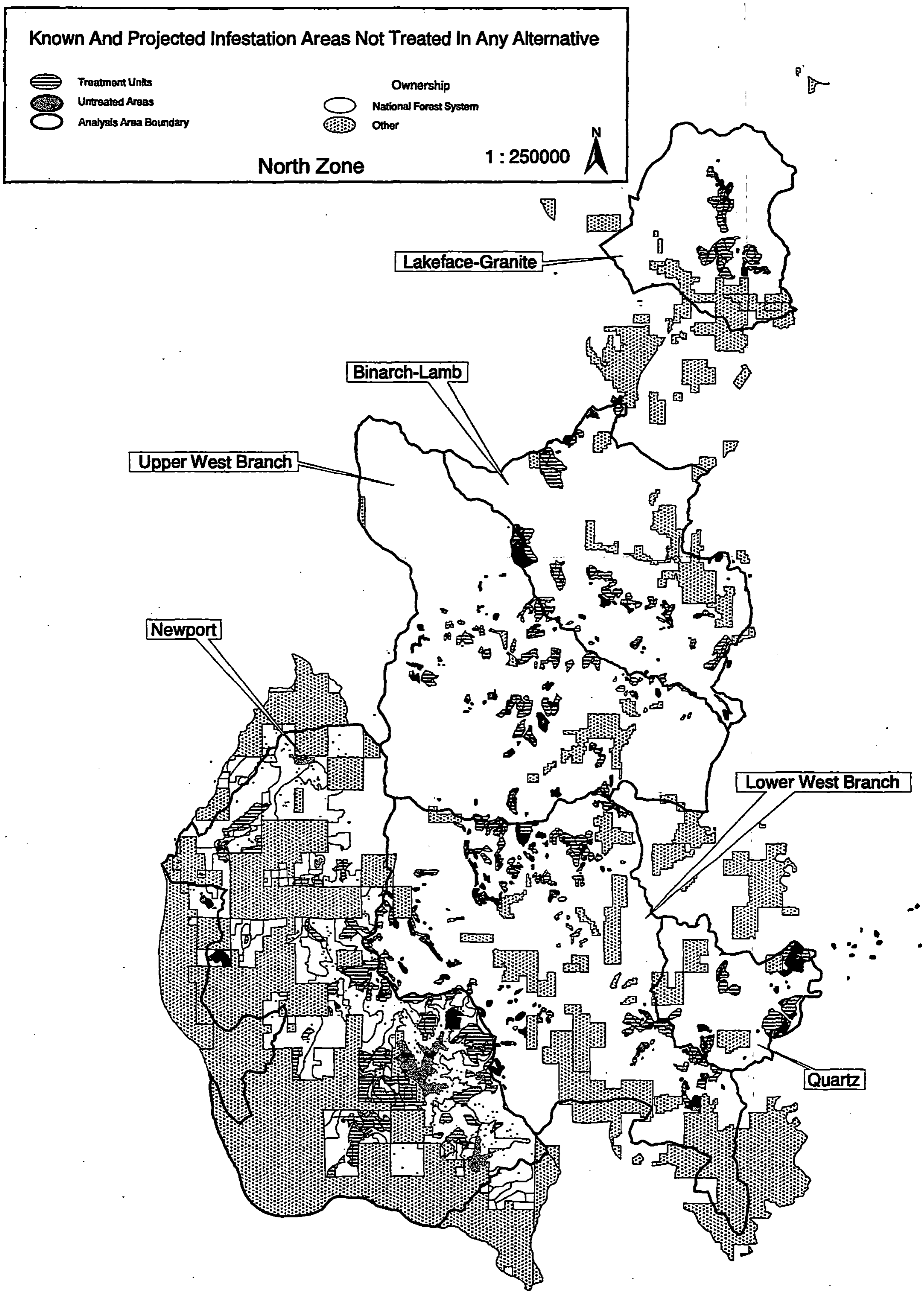
Snag Habitat. Historically, ecosystems in north Idaho were shaped by disturbance patterns that altered the size and distribution of various structures across the landscapes. Forest succession, wind damage, insects and disease, fire and other disturbances created snags in areas that ranged in size from individual trees to small patches or stands to entire drainages (1,000 acres or larger). Consequently, snag densities varied across the landscape, from areas with low levels of snags to other areas with abundant snags.

Recent studies indicate that viable woodpecker populations occurred in areas with about four snags per acre (Bull et al., 1997). Managing for viable populations of snag dependent species does not require providing for snags on every acre in any subdrainage or across the landscape. Bull et al. (1997) recommends providing snags every 5 to 25 acre stand to satisfy distribution needs. This project would strive to provide snags on every 5 acres to address more rigorous distribution needs due to past losses.

The present beetle epidemic has, is and would continue to kill live trees, thereby creating snags and areas of high snag densities. Under all action alternatives, some snags created by beetles would be harvested and lost as habitat for cavity-dependent species. However, the potential effects on snags and down wood would be influenced by a number of factors. Not all areas impacted by beetles would be treated; it is not the intent of this project to remove all pockets or patches of dead trees created by the Douglas-fir beetle outbreak. Concentrated pockets of snags would remain untreated and unaffected by any management across the landscape. Areas outside of proposed treatment areas are and will continue to provide snags in excess of numbers shown to support viable populations of cavity-dependent species. Areas would be reserved from treatment within Inland Native Fish Strategy buffers. These areas along with untreated stands would contribute to snags and cavity habitat.

Design features of the project were devised to ensure the retention and selection of snags at a level and distribution which has been shown to support viable populations of species which use snags and logs (design features, Chap II). Snags and snag replacements would be retained in all treatment units at levels recommended by scientific literature based on recent studies. Snag retention objectives exceed Forest Plans standards and snag retention levels developed by Thomas et al. (1979). Snag retention objectives, including compensation levels are consistent with recent published data that suggests that populations of cavity nesters were viable in stands of ponderosa pine and mixed conifer forests that contained about four snags per acre (Bull et al. 1997).

The project would meet Forest Plan goals and objectives for cavity habitat, and Forest Plan standards would be met or exceeded in all alternatives.


Known And Projected Infestation Areas Not Treated In Any Alternative
Treatment Units
Untreated Areas
Analysis Area Boundary
Ownership
National Forest System
Other
North Zone
1 : 250000
N
Lakeface-Granite
Binarch-Lamb
Upper West Branch
Newport
Lower West Branch
Quartz

ENVIRONMENTAL CONSEQUENCES

Introduction

This section displays and discusses the potential direct, indirect and cumulative impacts to wildlife from the proposed action and alternatives. The primary issues/concerns are associated with the level of late successional habitat and human disturbance/access. Changes in these aspects of wildlife habitat could impact existing habitat for Threatened, Endangered, and Sensitive species and Management Indicator Species and could affect future habitat suitability and management options for some wildlife species.

USDA Forest Service policy (Forest Service Manual 2670) requires a documented review (Biological Assessment) of Forest Service programs or activities in sufficient detail to determine how an action may affect Threatened, Endangered, Proposed, or Sensitive species. Consultation with U.S. Fish & Wildlife Service is mandatory if the Biological Assessment concludes that a proposed action may have an effect on federally-listed species or habitat.

The Biological Assessment for Threatened, Endangered, and Proposed species is a "stand-alone" document. It and the letter of concurrence from the U.S. Fish and Wildlife Service can be found in the project files ("Wildlife"). The documentation of effects and rationale for conclusions for Sensitive species are consolidated into the main text of the Final EIS and project file (USDA Forest Service, 1995). The Sensitive Species Summary of Conclusion of Effects can be found at the end of the Priest Lake Ranger District Wildlife section in this document.

Cumulative Effects Analysis Areas

For each species analyzed in this chapter, the cumulative effects area has been determined (Table III-217) and mapped (please refer to the enclosed maps). This determination is based on the species' or guilds' relative home range size in relation to its available habitat, topographic features (watershed boundaries) which relate to how species move and utilize their home range, and boundaries that represent the furthest extent of affects.

The existing condition is a culmination of past activities, whether they are human-caused or natural events. The expected changes in habitat conditions (i.e. stand structure) resulting from present and reasonably foreseeable future actions were included in the information databases. Therefore, the following analyzes of species are a cumulative representation of past, present and reasonably foreseeable future actions, including these incremental actions. Other cumulative actions not represented (i.e. projects on industrial private forest lands and State lands) would be discussed in the cumulative effects section of each analysis area. The analyzes assume that other ownerships do not contribute to the needs of the species except where specifically mentioned. Therefore, the burden of achieving habitat needs and species viability rests on National Forest lands.

Determination of Effects Calls

Changes in habitat are combined with other effects (i.e. security) and displayed separately for past, present and reasonably foreseeable actions. The resulting conclusion and the magnitude of the effect is rated either no effect, minor, moderate, or high (applies to beneficial or adverse affect).

> *No effect = unmeasureable effect or compensating adverse and beneficial effects*
> *Minor = individuals not likely affected*
> *Moderate = individuals may be affected, but populations would not be affected*
> *High = populations may be affected*

Indicators for Selected Species

The table below displays the indicators that would be used to measure effects on wildlife species. Indicators for each species would vary and would be based on those factors that could result in a measurable adverse or beneficial effect. For most species being analyzed, appropriate habitat parameters were measured to distinguish suitable habitat (specific parameters for individual species are located in the project file). The changes in suitable habitat for each relevant species is disclosed and a discussion of the effects on species is displayed in the Environmental Consequences Section.

The indicator(s) used to display potential effects on the species are developed based on this information. The indicator(s) used to display potential effects on the species would be identified and the rationale displayed.

Table III-216. Key indicators to measure effects, Priest Lake Ranger District.

Species	Indicator
Threatened	
Grizzly Bear	• changes to security (habitat effectiveness) and core habitat.
Proposed	
Lynx	• changes to suitable habitat and security.
Sensitive	
Fisher/Marten	• changes to suitable denning habitat and security.
Flammulated Owl/White-headed Woodpecker	• changes to suitable habitat.
Northern Goshawk	• changes to suitable nesting habitat and disturbance.
Management Indicator	
American Marten	• changes to suitable denning habitatand security.

Analysis Areas

The analysis/cumulative effects areas are depicted below, by species. The Lakeface-Granite, Binarch-Lamb, Upper West Branch, Lower West Branch, and Quartz mapping units are the 5th-code hydrologic units (watersheds) used in this analysis (please refer to the enclosed maps). Please refer to Appendix E for a list of ongoing and foreseeable projects used for the cumulative effects analysis.

Table III-217. Analysis areas for analyzed species.

Species	Analysis Areas
Grizzly Bear	Bear Management Units
Lynx	5th code hydrologic units
Fisher/Marten	5th code hydrologic unit
Flammulated Owl/White-headed Woodpecker	5th code hydrologic unit
Northern Goshawk	5th code hydrologic unit

Methodology

The level of analysis is dependent on a number of variables including but not limited to: the existing condition, the cause and effect relationship, the magnitude or intensity of effects, the contrast in effects between alternatives, the risks to resources, and the information necessary for an informed decision. The analysis is commensurate with the importance of the impact (CEQ 1502.15), the risk associated with the project, the species involved, and the level of knowledge already in hand (USDA Forest Service, 1992).

The geographic scope for the wildlife analysis varies by species. This analysis uses the following sources, which provide the primary direction, foundation and methods used to develop the analysis for potential effects on wildlife.

- *Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin*
- *IPNF Forest Plan, including Forest Plan Monitoring*
- *Available Conservation Assessments and Strategies for wildlife species*
- *Additional scientific literature as appropriate, including predictive habitat models.*

This analysis is organized by species. The main sections are:

- *Threatened, Endangered and Proposed Species*
- *Sensitive Species*

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

Threatened, Endangered, and Proposed Species

GRIZZLY BEAR

Kalispell - Granite Grizzly Bear Management Unit

Effects Common To All Alternatives

The Kalispell-Granite Grizzly Bear Management Unit would maintain at least 70 percent security with no net loss in core habitat. Core habitat would not change from existing condition and would remain at 44.2 percent through post activity. No high quality or key habitats would be impacted.

Effects Common To All Action Alternatives

There are no units or treatments areas proposed within the Kalispell-Granite Bear Management Unit. The associated habitats that would be impacted in the Binarch-Lamb area are a mixture of mid-elevation closed and open timber types.

Alternative design features would disallow using forage seeding mixes that would attract bears to areas adjacent to open roads, thus avoiding an increased mortality risk to grizzly bears.

Alternative A

Security would not change from existing condition.

Alternatives B, C, D, and E

All anticipated effects on security and core habitat are a result of influence zones (the distance within which grizzly bears are assumed to be affected) created by connected activities.

During timber harvest activities associated with Units b05, b06, and b07 would reduce the proportion of grizzly bear security by approximately 0.5 percent, resulting in a change in security from 80.7 to 80.3 in the spring, 72.4 to 71.9 in the summer and 77.4 to 76.9 in the fall.

Timber harvest activities associated with Alternative D (Units b05, b05a, b05b, b06, b06a and b07) would reduce the proportion of grizzly bear security by an additional 20 acres; however, this amount is basically indistinguishable at the mapping scale. Therefore, there would be relatively no difference between Alternatives B, C, D, and E.

Alternatives F and G

Security and core habitat would be the same as under the No-Action Alternative (Alternative A) because there are no activities proposed in these alternatives that have any influences on the Kalispell-Granite BMU.

Cumulative Effects (All Alternatives)

The condition of security and core habitat is based on effects of past, present and predicted activities that would impose impacts on security and core habitat, including Dusty Peak Timber Sale, the Reed-in Timber Sale, Snicks Toe Salvage, and developed road systems on Federal and private lands. Therefore, the predicted end products are cumulative effects assessment of the Kalispell-Granite BMU. No other cumulative effects are expected.

Table III-218. Summary of anticipated cumulative effects within the Kalispell-Granite Grizzly Bear Management Unit.

Alternatives	Spring Security (percent)	Summer Security (percent)	Fall Security (percent)	Core (percent)
A	80.7	72.4	77.4	44.2
B	80.3	71.9	76.9	44.2
C	80.3	71.9	76.9	44.2
D	80.2	71.9	76.9	44.2
E	80.3	71.9	76.9	44.2
F	80.7	72.4	77.4	44.2
G	80.7	72.4	77.4	44.2
Post Activity	80.7	72.4	77.4	44.2

Lakeshore Grizzly Bear Management Unit

Effects Common to All Alternatives

Security and the proportion of grizzly bear core habitat within the Lakeshore Grizzly Bear Management Unit would be maintained at or above existing levels, resulting in no net loss of either security or core habitat. No high quality or key habitats would be impacted.

Alternative A and G

Security and core habitat would not change from existing condition.

Effects Common To All Action Alternatives

Following completion of project-related activities (post activity), changes in road restrictions and long-term access would increase security to 34.1 percent in the spring and fall, and 32.3 percent in the summer. Core habitat would increase to 19.1 percent, post activity.

Alternative design features would disallow using forage seeding mixes that would attract bears to areas adjacent to open roads, thus avoiding an increased mortality risk to grizzly bears.

Effects Common To Alternatives B, C, D, and E.

Road obliteration would increase core habitat by 2.3 percent. However, this gain would be somewhat off-set by a 1.5 percent loss in core from timber harvest activities associated with Units w01, w01a, w02, w02a, w03, w04, w05, w15, w22, and w22a; resulting in a net gain of 0.8 percent during the implementation phase of the decision. This gain would place core habitat at 17.4 percent during implementation.

Road use restrictions and road obliteration would increase security by 6.5 percent in the spring and fall and 4.7 percent in the summer. However, this gain would be somewhat off-set by a 5.5 percent loss during the spring and fall and a 3.7 loss in security from timber harvest activities. This would result in a net gain of 1.0 percent in security habitat during the implementation phase of the decision. These gains would place security at 28.6 percent for the spring, summer and fall, during implementation.

Alternative F

Security gains realized from road use restrictions and road obliteration, combined with security losses associated with timber harvest activities, would increase spring and fall security by 2.5 percent and summer security by 1.2 percent. These gains would place security at 30.1 percent during the spring and fall and 28.8 percent during the summer, during implementation.

Cumulative Effects (All Alternatives)

The conditions of security and core habitat are based on the effects of past, present and predicted activities that would impose impacts on security and core habitat, including developed road systems on Federal and private lands. Therefore, the predicted end products are cumulative effects assessment of the Lakeshore BMU. No other cumulative effects are expected.

Project Opportunities

There would be no anticipated effects on grizzly bears from project related activities.

Table III-219. Summary of anticipated cumulative effects within the Lakeshore Grizzly Bear Management Unit.

Alternatives	Spring Security (percent)	Summer Security (percent)	Fall Security (percent)	Core (percent)
A	27.6	27.6	27.6	16.6
B	28.6	28.6	28.6	17.4
C	28.6	28.6	28.6	17.4
D	28.6	28.6	28.6	17.4
E	28.6	28.6	28.6	17.4
F	30.1	28.8	30.1	17.5
G				
Post Activity	34.1	32.3	34.1	19.1

LYNX

Effects Common To All Action Alternatives

Existing open road densities within analysis areas are generally high, contributing to relatively high vulnerability or low security for lynx. Design features would manage access to an extent that temporary, barriered, and non-drivable roads used to implement the Decision would remain restricted to motorized use (except for administrative use) during the implementation phase of the project, including post sale activities. Also, roads constructed for temporary use would be fully obliterated. Previously barriered and non-drivable roads would be secured in a manner that would conceal the road entrance and not attract use (front-end obliteration), improving the effectiveness to control motorized use (including winter motorized use). The application of these measures would not increase vulnerability to lynx beyond the existing condition.

In addition, all action alternatives would close (obliterate) between 11.9 and 12.3 miles of existing open road, thus reducing road densities that would contribute to a long term increase in security. Obliterated roads are more effective closures, especially concerning snowmobile access, and would reduce winter displacement and mortality risk.

Following activities such as timber harvest, fire or a combination of both, temporary non-suitable habitat is sometimes created when the vegetation is set back to the early seral stages. Lynx would generally make little or no use of these areas until vegetational recover occurs which is anticipated to occur after approximately 10 years.

Table III-220. Acres and percent (in parenthesis) of habitat for lynx, in analysis areas of the Priest Lake Ranger District.

Analysis Area	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Lakeface-Granite (15,402 ac)								
Capable Habitat	8,678	8,678	8,678	8,678	8,678	8,678	8,678	8,678
Suitable Foraging	1,316 (15.2)	1,316 (15.2)	1,314 (15.1)	1,314 (15.1)	1,309 (15.0)	1,302 (15.0)	1,313 (15.0)	1,316 (15.2)
Suitable Denning	4,024 (45.9)	3,617 (41.2)	3,617 (41.2)	3,617 (41.2)	3,617 (41.2)	3,617 (41.2)	3,617 (41.2)	3,617 (41.2)
Pre-foraging	518 (5.9)	832 (9.6)	845 (9.7)	872 (10.0)	918 (10.5)	846 (9.7)	914 (10.5)	832 (9.6)
Open road density	2.20	2.20	2.12	2.12	2.12	2.12	2.12	2.12
Restricted road density	.69	.69	.53	.53	.53	.53	.53	.53
Binarch-Lamb (27,548 ac)								
Capable Habitat	11,663	11,663	11,663	11,663	11,663	11,663	11,663	11,663
Suitable Foraging	3,226 (27.7)	3,226 (27.7)	3,214 (27.6)	3,214 (27.6)	3,214 (27.6)	3,214 (27.6)	3,214 (27.6)	3,226 (27.7)
Suitable Denning	3,094 (25.7)	2,371 (19.5)	2,371 (19.5)	2,371 (19.5)	2,371 (19.5)	2,371 (19.5)	2,371 (19.5)	2,371 (19.5)
Pre-foraging	997 (8.5)	1,238 (10.6)	1,430 (12.5)	1,388 (12.1)	1,447 (12.4)	1,375 (12.0)	1,289 (11.3)	1,238 (10.6)
Open road density	2.18	2.18	2.15	2.15	2.15	2.15	2.15	2.11
Restricted road density	1.27	1.27	1.26	1.26	1.26	1.26	1.26	1.26
Upper W. Branch (45,435 ac)								
Capable Habitat	29,171	29,171	29,171	29,171	29,171	29,171	29,171	29,171
Suitable Foraging	6,756 (23.2)	6,756 (23.2)	6,738 (23.1)	6,738 (23.1)	6,756 (23.2)	6,745 (23.1)	6,755 (23.2)	6,756 (23.2)
Suitable Denning	11,455 (37.7)	10,377 (34.0)	10,324 (33.8)	10,324 (33.8)	10,302 (33.7)	10,351 (33.9)	10,361 (34.0)	10,377 (34.0)
Pre-foraging	1,494 (5.1)	1,845 (7.8)	2,308 (9.4)	2,319 (9.5)	2,573 (10.3)	2,150 (8.8)	1,940 (8.1)	1,845 (7.8)
Open road density	2.45		2.42	2.42	2.42	2.42	2.41	2.40
Restricted road density	.58		.52	.52	.52	.52	.57	.48
Lower W. Branch (47,843 ac)								
Capable Habitat	13,844	13,844	13,844	13,844	13,844	13,844	13,844	13,844
Suitable Foraging	3,173 (22.9)	3,173 (22.9)	3,131 (22.6)	3,131 (22.6)	3,173 (22.9)	3,157 (22.8)	3,139 (22.7)	3.173 (23.0)
Suitable Denning	7,138 (51.1)	6,546 (46.8)	6,318 (45.2)	6,318 (45.2)	6,293 (45.0)	6,400 (45.8)	6,318 (45.2)	6,400 (46.0)
Pre-foraging	1,043 (7.5)	1,406 (10.3)	1,570 (11.5)	1,610 (11.8)	1,651 (12.1	1,585 (11.6)	1,543 (11.4)	1,474 (11.0)
Open road density	2.21		2.18	2.18	2.16	2.18	2.17	2.16
Restricted road density	1.24		1.20	1.20	1.13	1.20	1.15	1.13
Quartz 5 (9,569 ac)								
Capable Habitat	2,952	2,952	2,952	2,952	2,952	2,952	2,952	2,952
Suitable Foraging	231 (7.8)	231 (7.8)	221 (7.5)	221 (7.5)	231 (7.8)	221 (7.5)	221 (7.5)	231 (7.8)
Suitable Denning	909 (28.8)	850 (26.8)	799 (25.0)	799 (25.0)	799 (25.0)	825 (25.9)	799 (25.0)	770 (26.0)
Pre-foraging	148 (5.0)	182 (6.1)	265 (9.0)	210 (7.4)	210 (7.4)	210 (7.4)	210 (7.4)	182 (6.1)
Open road density	1.41		1.41	1.41	1.41	1.41	1.41	1.41
Restricted road density	1.50		1.50	1.50	1.50	1.50	1.50	1.42
Total Capable Habitat	66,308	66,308	66,308	66,308	66,308	66,308	66,308	66,308
Total Suitable Foraging	14,702 (22.2)	14,702 (22.2)	14,618 (22.1)	14,618 (22.1)	14,683 (22.1)	14,639 (22.1)	14642 (22.1)	14,702 (22.2)
Total Suitable Denning	26,620 (40.1)	23,761 (35.8)	23,429 (35.3)	23,429 (35.3)	23,382 (35.3)	23,564 (35.5)	23,466 (35.4)	23,535 (35.5)
Total Pre-foraging	4,200 (6.3)	5503 (8.3)	6,418 (9.7)	6,299 (9.6)	6,799 (10.3)	6,166 (9.3)	5,896 (8.9)	5,571 (8.4)

Lakeface-Granite Analysis Area

Effects Common to All Alternatives

Direct and Indirect Effects

The Lakeface-Granite Analysis Area consists of 8,678 acres of capable lynx habitat, 1,316 acres (15.2 percent of analysis area) of suitable foraging habitat and 4,024 acres (45.9 percent of analysis area) identified as suitable lynx denning habitat. Approximately 518 acres (5.9 percent of analysis area) within the analysis area are considered as pre-forage habitat. Denning habitat is generally distributed throughout the analysis area with the majority of the denning habitat being located within the vicinity of Granite and Watson Mountains. Forage habitat is also distributed throughout the analysis area within the best juxtapositions with denning habitat being in the vicinity of the Tango Creek drainage and along Watson Mountain.

For lynx, high open road densities can result in displacement from suitable habitat, elevated mortality risk, and direct habitat loss. Approximately 7.81 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.20 to 2.12 miles per square mile of area, and restricted road density would be reduced from .69 to .53 miles per square mile of area. This overall reduction in road densities from the proposed activities coupled with increased closure effectiveness would result in a net increase in security for lynx and also a reduction in lynx mortality.

Snowplowing to access winter logging sites would temporarily reduce the amount of groomed snowmobile trails within this analysis area by approximately 13 miles. This impact would be temporary as it is anticipated to occur within either one to two winter seasons. It is anticipated that the plowed roads would have a similar impact as groomed snowmobile trails in regard to providing easy access for competitive predators into lynx habitat.

Design criteria that is incorporated in project design would maintain patches of overstory cover within proposed harvest Units Watson 06, 07, 07a, 08 and 12. The design criteria are anticipated to maintain a set of habitat conditions which would continue to facilitate lynx movement and utilization of available habitat within the analysis area.

Cumulative Effects

No known activities associated with private lands within the analysis area are anticipated to have an impact on lynx or lynx habitat. Winter recreation, such as snowmobiling, is a popular activity within the Lakeface-Granite analysis area. Approximately 35 miles of groomed snowmobile trails facilitate high levels of winter recreational use into a large portion of lynx habitat within this analysis area. Other roads considered as open, or seasonally restricted, provide additional winter access. Often many of these road are heavily used. In addition, open and semi-open areas adjacent to developed trails and other areas of high use often receive periodic dispersed snowmobile use. It is believed that lynx may be displaced from areas where high levels of winter recreational use occurs, which may possibly reduce the availability of winter forage habitat within the analysis area. Maintained trails for snowmobiling provides easy access for winter trapping for other furbearers which is known to be a potential source of lynx mortality. Also, maintained winter recreational trails, high-use dispersed winter snowmobile areas and snow play areas are known to provide increased opportunities for competing predators such as the coyote and bobcat to enter areas occupied by lynx. The cumulative impacts on lynx habitat within the Lakeface-Granite analysis area would be low. The cumulative impacts resulting from access provided from high road densities and winter recreation would be reduced as a result of project design criteria associated with implementation of the proposed alternatives.

Direct and Indirect Effects

Alternative A

As a result of the Douglas-fir bark beetle, tree mortality and the subsequent impacts to overstory cover has resulted in a reduction in the amount of 406 acres of suitable denning habitat for lynx. This has resulted in denning habitat being reduced from 45.9 to 41.2 percent of the analysis area. The amount of pre-forage habitat within the analysis area has been increased by 314 acres, thus increasing the amount of pre-forage habitat by 3.7 percent to a total of 9.6 percent. Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, thus in many instances enhancing the suitability of the habitat for lynx to raise kittens. There would be no short-term increase in the amount of lynx foraging habitat within the analysis area as a direct result of the timber mortality. The dispersion of remaining denning and forage habitat within the analysis area has been little impacted by the timber mortality associated with the Douglas-fir beetle.

Alternative B

Management activities would not result in any measurable changes in the amount of lynx forage or denning habitat available over what has already occurred or is anticipated to occur as a result of the beetle-related tree mortality. Timber harvest and subsequent post-harvest activities would increase the amount of pre-forage habitat within the analysis area by 13 acres over the amount already resulting from the beetle induced mortality. (Table III-220). There would be no measurable short-term increase in the amount of lynx foraging habitat within the analysis area as a direct result of the timber mortality. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area. Although the amount of preforage habitat would increase, the changes are anticipated to be small and likely would not result in changes in potential use of the area by lynx or overall lynx populations

Alternative C

Management activities would not result in any measurable changes in the amount of lynx forage or denning habitat available over what has already occurred or is anticipated to occur as a result of the beetle-related tree mortality. Timber harvest and subsequent post harvest activities would increase the amount of pre-forage habitat within the analysis area by 40 acres more then the amount already resulting from the beetle induced mortality. The amount of pre-forage habitat would be increased from 9.6 to 10.0 percent of the analysis area. It is anticipated that implementation of this alternative would have little impact on lynx regarding the utilization or the availability of important habitat components. (Table III-220). There would be no measurable short-term increase in the amount of lynx foraging habitat within the analysis area as a direct result of the timber mortality. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area

Alternative D

Management activities would not result in any measurable changes in the amount of denning habitat available over what has already occurred or is anticipated to occur as a result of the beetle-related tree mortality. The amount of forage habitat would be reduced only slightly. Timber harvest and subsequent post harvest activities would increase the amount of pre-forage habitat within the analysis area by 86 acres more then the amount already resulting from the beetle induced mortality. The amount of pre-forage habitat would be increased from 9.6 to 10.5 percent of the analysis area. (Table III-220). There would be no measurable short-term increase in the amount of lynx foraging habitat or the amount of pre-forage lynx habitat within the analysis area as a direct result of the timber mortality. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Alternative E

Management activities would not result in any measurable changes in the amount of denning habitat that is available over the reductions which have incurred as a result of the beetle-related tree mortality. The amount of forage habitat would be reduced by 14 acres. Timber harvest and subsequent post harvest activities would increase the amount of pre-forage habitat within the analysis area by 14 acres more then the amount already resulting from the beetle induced mortality (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area. Although, forage habitat would be increased and the amount of pre-forage habitat would increase, the changes are anticipated to be small and likely would not result in changes in potential use of the area by lynx or overall lynx populations

Alternative F

Management activities would not result in any measurable changes in the amount of lynx forage or denning habitat available over the reductions which have incurred as a result of the beetle-related tree mortality which has already occurred. Timber harvest and subsequent post harvest activities would increase the amount of pre-forage habitat within the analysis area by 82 acres more then the amount already resulting from the beetle induced mortality. The amount of pre-forage habitat would be increased from 9.6 to 10.5 percent of the analysis area. (Table III-220). There would be no measurable short-term increase in the amount of lynx foraging habitat or the amount of pre-forage lynx habitat within the analysis area as a direct result of the timber mortality. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Alternative G

Implementation of this alternative would have no impact on lynx habitats within this analysis area beyond those already discussed under Effects Common to All Alternatives. Habitat conditions would remain relatively unchanged apart from the changes brought about by the Douglas-fir beetle (Table III-220).

Binarch-Lamb Analysis Area

Effects Common to All Action Alternatives

Direct and Indirect Effects: Acres of lynx habitat in the Binarch-Lamb Analysis Area is displayed in Table III-220. Denning habitat is generally distributed throughout the analysis area, with the majority of the denning habitat being located within the vicinity of Granite and Watson Mountains. Forage habitat is also distributed throughout the analysis area, with the majority of the lynx foraging habitat located within the Lamb Creek drainage in the western portion of the Binarch-Lamb Analysis Area. Denning habitat is located generally along Binarch Ridge.

Displacement from suitable habitat, elevated mortality risk, and direct habitat loss are all consequences of high open road densities. As part of the proposed actions roads would be obliterated. Implementation of Alternatives A through F would result in approximately 3.15 miles of road within the analysis area obliterated or rendered impassable to motorized vehicles. Open and restricted road density would be reduced from 2.18 to 2.15 square miles and from 1.27 to 1.26 square miles, respectively. Under Alternative G, an additional 1.86 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open and restricted road density would be reduced from 2.18 to 2.11 square miles and from 1.27 to 1.26 square miles, respectively. Road closures within the Binarch-Lamb Analysis Area are anticipated to have a positive impact on lynx as road related disturbance and risk of mortality risk would be reduced.

Design criteria that is incorporated in project design would maintain patches of overstory cover within the proposed harvest areas: Binarch 01 and 01a. The design criteria are anticipated to maintain a set of habitat conditions which would continue to facilitate lynx movement and utilization of the analysis area.

Snowplowing to access winter logging locations would temporarily reduce the amount of groomed snowmobile trails within this analysis area by approximately 16 miles. This impact would be temporary as it is anticipated to occur within either one or two winter seasons. It is anticipated that the plowed roads would have a similar impact as groomed snowmobile trails in regard to providing easy access for competition predators into lynx habitat.

Cumulative Effects: Cumulative impacts on habitat for lynx have been taken into consideration as part of the analysis process. No known activities associated with private lands within the analysis area are anticipated to have an impact on lynx or lynx habitat. Winter recreation such as snowmobiling is a popular activity within this analysis area. Approximately 29 miles of groomed snowmobile trails facilitate high levels of winter recreational use into a large portion of lynx habitat within this analysis area. Roads 639, 336, 313 and 1345 are maintained for winter recreation. Other roads which are open, but not groomed, provide winter access for winter recreationists. Often many of these roads are heavily used. In addition, open and semi-open areas adjacent to developed trails and other areas of high use often receive periodic dispersed snowmobile use. It is thought that lynx may be displaced from areas where high levels of winter recreational use occurs, this may possibly reduce the availability of winter forage habitat within the analysis area. Maintained trails for snowmobiling provides easy access for winter trapping for other furbearers which is known to be a potential source of lynx mortality. Also, maintained winter recreational trails, high use dispersed winter snowmobile areas and snow play areas are known to provide access for competing predators such as the coyote and bobcat to enter areas occupied by lynx. Competition by these predators is anticipated to result in the direct competition for prey species. The cumulative impacts on lynx habitat within the Binarch-Lamb analysis area resulting from proposed and past activities would be low. The cumulative impacts resulting from access provided from high road densities and winter recreation would be reduced as a result of project design criteria associated with implementation of the proposed alternatives.

Direct and Indirect Effects

Alternative A: Tree mortality and the subsequent reduction in overstory cover has resulted in a reduction of suitable denning habitat for lynx, by 723 acres (from 25.7 to 19.5 percent of the analysis area). Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, thus enhancing the suitability for lynx to raise kittens. There would be no short-term increase in the amount of lynx foraging habitat within the analysis area as a direct result of the Douglas-fir beetle-related timber mortality. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Alternatives B and C: Management activities would not result in any measurable changes in the amount of denning habitat available over the reductions which have incurred as a result of the beetle-related tree mortality that has already occurred. The amount of forage habitat would decrease by 237 acres as management activities such as regeneration harvest and underburning occur, increasing the amount of temporary non-suitable habitat for lynx (Table III-220). The total amount of pre-forage lynx habitat created would be 406 acres, increasing the amount of pre-forage habitat within the analysis area by 1.9 percent under Alternative B, and by 1.5 percent under Alternative C. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Alternative D: Management activities would not result in any measurable changes in the amount of denning habitat available over the reductions which have incurred as a result of the beetle-related tree mortality which has already occurred. The amount of forage habitat would be relatively unchanged. Management activities such as regeneration harvest and underburning would occur, thus increasing the amount of pre-forage

habitat for lynx by 209 acres or by 1.8 percent to 12.4 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Alternative E: No reductions in the amount of lynx denning habitat would occur as a result of this alternative beyond the level impacted by the beetle-related tree mortality. Management activities associated with salvage and site treatment would result decrease the amount of forage habitat available and also increase the amount of temporary non-suitable habitat by 137 acres, thus increasing the proportion of pre-forage lynx habitat from 10.6 to 12.0 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Alternative F: Additional reductions in the amount of lynx denning habitat would not occur as a result of this alternative beyond the levels impacted by the beetle-related tree mortality. Management activities associated with salvage and site treatment would result in a decrease in the amount of forage habitat available and also increase the amount of temporary non-suitable habitat by 51 acres, thus increasing the proportion of pre-forage lynx habitat from 10.6 to 11.3 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Alternative G: No impacts to important lynx habitat components would occur as a result of implementation of this alternative. The effects would be similar to alternative A. (Table III-220).

Upper West Branch Analysis Area

Effects Common to All Action Alternatives

Direct and Indirect Effects: Acres of lynx habitat in the Upper West Branch Analysis Area are displayed in Table III-220. Generally, denning habitat for lynx is distributed throughout much of the analysis area providing ample opportunity for lynx denning. Forage habitat for lynx is also distributed through the analysis area with the exception of the upper reaches of the Upper West Branch, where quality forage habitat is lacking. The juxtaposition of forage and denning habitats is generally well distributed throughout this analysis areas with the exception of the upper reach of the Upper West Branch. Several major ridges systems within this analysis area appear to provide for lynx movement and distribution. The Shedroof Divide likely provides important north-south movement and secondary ridge systems provide for east-west movement to the lower limits of lynx habitat within the analysis area. The ridge system which divides the Upper West Branch and Binarch Creek also appears important in providing for movement to the eastern portion of this analysis area. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

In conjunction with timber harvest, roads would also be obliterated. Approximately 7.81 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open and restricted road density would be reduced from 2.45 to 2.42 miles per square mile of area and from .58 to .52 miles per square mile of area, respectively. The reduction in open and restricted road densities are anticipated to have a positive impact on lynx as road related disturbance and the associated risk of mortality would be reduced.

The effects associated with high levels of winter recreation and distribution of winter recreation within lynx habitat would be reduced as a result of elimination of approximately 11 miles of groomed snowmobile routes within the analysis area. The partial obliteration of Roads 1108 and 333 would eliminate this popular connector loop. This would have little impact on lynx as most of the roads length is located outside of what is considered lynx habitat.

Project design criteria would maintain patches of overstory cover within Units Tola 05, 03 and 03a. The design criteria are anticipated to maintain a set of habitat conditions which would continue to facilitate lynx movement and utilization of the analysis area.

Cumulative Effects: Within the Upper West Branch Analysis Area other ongoing or reasonably foreseeable activities which would have an impact on lynx have been included in the determination of the total amount of habitat which is currently suitable either as foraging habitat, denning habitat or as temporarily non-suitable for lynx. Activities schedule for 1999 on Crown Pacific Timber Company Lands would also impact an undetermined amount of habitat for lynx.

Winter recreation such as snowmobiling is a popular activity within this analysis area. Approximately 43 miles of groomed snowmobile trails are located within this analysis area. Maintained snowmobile trails on Roads 312, 219, 659, 305 and 338 provide winter access into a large portion of lynx habitat within this area. Other roads which are open, but not groomed, also provide winter access and are often heavily used by winter recreationists. In addition, open and semi-open areas adjacent to developed trails or other areas of high recreational use often receive periodic high levels of dispersed snowmobile use. It is thought that lynx may be displaced from areas where high levels of winter recreational use occurs, thus these activities may tend to reduce the availability of winter foraging habitat. Maintained trails for snowmobiling provides easy access for winter trapping for other furbearers which is known to be a potential source of lynx mortality. Also, maintained winter recreational trails, high use dispersed winter snowmobile areas and snow play areas are known to provide an access for competing predators such as the coyote and bobcat to enter areas occupied by lynx. Competition by these predators is anticipated to result in the direct competition for prey species. The cumulative impacts on lynx habitat within the Upper West Branch analysis area resulting from proposed and past activities would be low. The cumulative impacts resulting from access provided from high road densities and winter recreation would be reduced as a result of project design criteria associated with implementation of the proposed alternatives.

Direct and Indirect Effects

Alternative A: Tree mortality and subsequent reduction in overstory cover has resulted in a reduction in the amount of 1,078 acres of suitable denning habitat for lynx (from 37.7 to 34 percent of the area). Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, enhancing the suitability for lynx to raise kittens. There are no short-term increases in the amount of lynx foraging habitat or the amount of temporary non-suitable habitat within the analysis area as a direct result of the timber mortality. The dispersion of denning and forage habitat within the analysis area has been little impacted by tree mortality associated with the Douglas-fir beetle.

Alternatives B and C: Management activities would reduce denning habitat within the analysis area by 53 acres over what has already occurred, or is anticipated to occur, as a result of the beetle-related tree mortality. The amount of forage habitat would be reduced by 18 acres. Management activities such as regeneration harvest and underburning would increase the amount of pre-forage lynx habitat by 463 acres (from 7.8 to 9.4 percent of the analysis area) under Alternative B, and by 474 acres (from 7.8 to 9.5 percent of the analysis area) under Alternative C (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Approximately 22.29 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open and restricted road density would be reduced from 2.45 to 2.42 miles per square mile of area under Alternative B, and from .58 to .52 miles per square mile of area under Alternative C.

Alternative D: Management activities would reduce denning habitat within the analysis area by 75 acres over what has already occurred, or is anticipated to occur, as a result of the beetle-related tree mortality. The amount of forage habitat available would remain relatively unchanged. Management activities such as

regeneration harvest and underburning would increase the amount of pre-forage lynx habitat for lynx by 728 acres, from 7.8 to 10.3 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Approximately 22.29 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.45 to 2.42 miles per square mile of area, and restricted road density would be reduced from .58 to .52 miles per square mile of area.

Alternative E: Management activities would reduce denning habitat within the analysis area by 26 acres over what has already occurred, or is anticipated to occur, as a result of the beetle-related tree mortality. The amount of forage habitat would be reduced by 11 acres, but would be relatively unchanged when considering the analysis area overall. Management activities such as regeneration harvest and underburning would increase the amount of pre-forage lynx habitat for lynx by 305 acres, or from 7.8 to 8.8 percent of the analysis area (Table III-220).

Approximately 22.29 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.45 to 2.42 miles per square mile of area, and restricted road density would be reduced from .58 to .52 miles per square mile of area.

Alternative F: No additional reductions in the amount of lynx denning habitat would occur as a result of this alternative beyond the levels impacted by the beetle-related tree mortality. The amount of forage habitat would be reduced by 16 acres. Management activities such as regeneration harvest and underburning would occur thus increasing the amount of pre-forage lynx habitat for lynx by 95 acres or from 7.8 to 8.1 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Prior to implementation of timber harvest, roads would be obliterated. Approximately 27.04 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.45 to 2.42 miles per square mile of area, and restricted road density would be reduced from .58 to .57 miles per square mile of area.

Alternative G: No impacts to important lynx habitat components would occur as a result of implementation of this alternative (Table III-220). Prior to implementation of timber harvest, roads would be obliterated. Approximately 28.02 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.45 to 2.42 miles per square mile of area, and restricted road density would be reduced from .58 to .57 miles per square mile of area.

Lower West Branch Analysis Area

Effects Common to All Action Alternatives

Direct and Indirect Effects: Acres of lynx habitat in the Lower West Branch Analysis Area are displayed in Table III-220. Denning habitat is generally distributed throughout the analysis area. Forage habitat is also distributed throughout the analysis area with the best juxtaposition with denning habitat being in the vicinity of Ole and Mosquito Creek drainages.

The total miles of open or drivable roads within this analysis area are relatively high. Roads which have been identified for closure or obliteration that would be either implemented as part of the alternative or implemented as an opportunity would contribute to a reduction in the total road density within the Lower West Branch Analysis Area. These road closures within the Analysis Area are anticipated to have a positive impact on lynx as road related disturbance and risk of mortality risk would be reduced.

Project design criteria would maintain patches of overstory cover within the proposed harvest Unit Flat Goose 06. The design criteria are anticipated to maintain a set of habitat conditions which would continue to facilitate lynx movement and utilization of available habitats the analysis area.

Cumulative Effects: Within the Lower West Branch Analysis Area, other ongoing or reasonably foreseeable activities which would have an impact on lynx have been included in the determination of the total amount of habitat which is currently suitable either as foraging habitat, denning habitat or as temporarily non-suitable for lynx. Activities such as timber harvest and road construction on lands managed by the Idaho Department of Lands within the Pine Creek drainage would reduce the amount of suitable habitat. Activities scheduled by Stimson Lumber Company within the Snow Creek drainage may also impact habitat for lynx. The reduction in road densities coupled with increased closure effectiveness would result in an overall increase in security for lynx. The cumulative impacts on lynx habitat within the Lower West Branch analysis area resulting from proposed and past activities would be low. The cumulative impacts resulting from access provided from high road densities and winter recreation would be reduced as a result of project design criteria associated to implementation of the proposed alternatives.

Direct and Indirect Effects

Alternative A: Tree mortality and subsequent reduction in overstory cover has resulted in a reduction in the amount of 592 acres of suitable denning habitat for lynx. This has resulted in denning habitat being reduced from 51.1 to 46.8 percent of the analysis area. Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, enhancing the suitability for lynx to raise kittens. There are no short-term increases in the amount of lynx foraging habitat or the amount of temporary non-suitable habitat within the analysis area because of no underburning. The dispersion of denning and forage habitat within the analysis area has been little impacted by the timber mortality associated with the Douglas-fir beetle.

Alternatives B and C: Management activities would result in an additional reduction of 228 acres of denning habitat for lynx, reducing the proportion of denning habitat available from 46.8 to 45.2 percent of the analysis area. Forage habitat would be reduced slightly (42 acres), resulting in a decrease in foraging habitat from 22.9 to 22.6 percent within the analysis area. The total amount of pre-forage lynx habitat produced would be increased by 164 acres (from 10.3 to 11.5 percent of the analysis area) under Alternative B, and by 204 acres (from 10.3 to 11.8 percent of the analysis area) under Alternative C (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

As part of the proposed actions roads would be obliterated. Approximately 6.07 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.21 to 2.18 miles per square mile of area, and restricted road density would be reduced from 1.24 to 1.20 miles per square mile of area, respectively.

Alternative D: Denning habitat would be reduced by 253 acres over reductions caused by the outbreak of the Douglas-fir beetle, further reducing denning habitat from 46.8 to 45.0 percent of the analysis area. Foraging habitat would not be impacted. Management activities such as regeneration harvest and underburning would increase the amount of pre-forage lynx habitat by 245 acres, from 10.3 to 12.1 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

As part of the proposed actions roads would be obliterated. Approximately 12.54 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.21 to 2.16 miles per square mile of area, and restricted road density would be reduced from 1.24 to 1.13 miles per square mile of area. If timber salvage does not occur within the potential

expansion harvest areas, road obliteration would only occur on 5.9 miles of road within this analysis area. The resulting road density would be somewhat less than if this alternative were fully implemented.

Alternative E: Denning habitat would be reduced by 146 acres over reductions caused by the reductions incurred by the outbreak of the Douglas-fir beetle, further reducing denning habitat from 46.8 to 45.8 percent of the analysis area. Approximately 16 acres of foraging habitat would be impacted. Management activities such as regeneration harvest and underburning would occur thus increasing the amount of pre-forage lynx habitat for by 179 acres, from 10.3 to 11.6 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

As part of the proposed actions roads would be obliterated. Approximately 6.07 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.21 to 2.18 miles per square mile of area, and restricted road density would be reduced from 1.24 to 1.20 miles per square mile of area.

Alternative F: Denning habitat would be reduced by 228 acres over what has already occurred due to the outbreak of the Douglas-fir beetle, further reducing denning habitat from 46.8 to 45.2 percent of the analysis area. Approximately 34 acres of foraging habitat would be impacted. Management activities such as regeneration harvest and underburning increase the amount of pre-forage lynx habitat by 137 acres, from 10.3 to 11.4 percent of the analysis area (Table III-220). Management activities and associated habitat changes from the beetle-related tree mortality would maintain the important lynx habitat component within the desired range. It is anticipated that impacts would be short term in nature. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

As part of the proposed actions roads would be obliterated. Approximately 9.32 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open and restricted road density would be reduced from 2.21 to 2.17 miles per square mile of area, and from 1.24 to 1.15 miles per square mile of area.

Alternative G: Denning habitat would be reduced by 146 acres over what has occurred as a result of the Douglas-fir beetle outbreak, further reducing denning habitat from 46.8 to 46.0 percent of the analysis area. Foraging habitat would not be impacted. Management activities such as regeneration harvest and underburning would increase the amount of pre-forage lynx habitat by 68 acres, from 10.3 to 11.0 percent of the analysis area (Table III-220).

Approximately 17.46 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would be reduced from 2.21 to 2.16 miles per square mile of area, and restricted road density would be reduced from 1.24 to 1.13 miles per square mile of area.

Quartz Analysis Area

Effects Common to All Action Alternatives

Direct and Indirect Effects: Acres of lynx habitat in the Quartz Analysis Area are displayed in Table III-220. The overall reduction in road densities from the proposed activities coupled with increased closure effectiveness would result in a net increase in security for lynx and also a reduction in lynx mortality. The reduction in road densities coupled with increased closure effectiveness would result in an overall increase in security for lynx.

Cumulative Effects: Within the Quartz Analysis Area, other ongoing or reasonably foreseeable activities which would have an impact on lynx from the standpoint of security include: activities on private lands, Art's

Roadside Timber Salvage, Fedar White Pine Salvage, and the Dusty Peak Timber Sale. Mortality risk is moderate due to past management activities and snowmobile use in the area. Cumulative effects to security and suitable habitats from all activities (including private lands) would be moderate under Alternatives B, C and E. The cumulative impacts on lynx habitat within the Quartz analysis area resulting from proposed and past activities would be low. The cumulative impacts resulting from access provided from high road densities and winter recreation would be reduced as a result of project design criteria associated to implementation of the proposed alternatives.

Direct and Indirect Effects

Alternative A: The majority of lynx foraging habitat is located within the vicinity of Jasper Mountain and from Quartz Mountain to Pee Wee Ridge. Generally the interspersion of denning and foraging habitat is poor.

Tree mortality and subsequent reduction in overstory cover has resulted in a reduction of suitable denning habitat for lynx, by 59 acres (from 28.8 to 26.8 percent of the analysis area). Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, enhancing the suitability for lynx to raise kittens. There would be no short-term increases in the amount of lynx foraging habitat or the amount of temporary non-suitable habitat within the analysis area as a direct result of the timber mortality.

Alternatives B and C: Denning habitat would be reduced by 51 acres over reductions caused by the Douglas-fir beetle outbreak, further reducing denning habitat from 26.8 to 25.0 percent of the analysis area (Table III-220). Approximately 10 acres of lynx foraging habitat would be impacted. The total amount of pre-forage lynx habitat produced would be increased by 83 acres (from 6.1 to 9.0 percent of the analysis area) under Alternative B, and by 28 acres (from 6.1 to 7.4 percent of the analysis area) under Alternative C. The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Open and restricted road densities within lynx habitat would remain unchanged from the current condition.

Alternative D: Management activities would reduce the amount of denning habitat by 51 acres over what has already occurred, or is anticipated to occur, as a result of the beetle-related tree mortality. Denning habitat would be reduced from 26.8 to 25.0 percent of the analysis area. The amount of forage habitat would be relatively unchanged. Management activities such as regeneration harvest and underburning would increase the amount of temporary non-suitable habitat for lynx by 28 acres, from 6.1 to 7.4 percent of the analysis area (Table III-220).

Open and restricted road densities within lynx habitat would remain unchanged from the current condition.

Alternative E: Denning habitat would be reduced by 25 acres over reductions caused by the Douglas-fir beetle outbreak, further reducing denning habitat from 26.8 to 25.9 percent of the analysis area. Approximately 10 acres of lynx foraging habitat would be impacted. The total amount of pre-forage lynx habitat produced would be increased by 28 acres, from 6.1 to 7.4 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Open and restricted road densities within lynx habitat would remain unchanged from the current condition.

Alternative F: Denning habitat would be reduced by 50 acres over reductions caused by the outbreak of the Douglas-fir beetle, further reducing denning habitat from 26.8 to 25.0 percent of the analysis area. Approximately 10 acres of lynx foraging habitat would be impacted. The total amount of pre-forage lynx

habitat produced would be increased by 28 acres or from 6.1 to 7.4 percent of the analysis area (Table III-220). The proposed management activities would have little impact on the dispersion of denning and foraging habitat within the analysis area.

Open and restricted road densities within lynx habitat would remain unchanged from the current condition of 1.41 miles of road per square mile for open roads, and 1.50 miles of road per square mile of area for restricted roads.

Alternative G: No impacts or reduction in lynx forage habitat would occur. No increases in the amount of lynx pre-forage habitat would occur. Denning habitat for lynx would be reduced by approximately 80 acres thus reducing the amount from 26.8 to 26.0 percent of the analysis area (Table III-220).

Approximately 2.34 miles of road within the analysis area would be obliterated or rendered impassable to motorized vehicles. Open road density would remain unchanged at 1.41 miles per square mile of area, whereas restricted road density would be reduced from 1.50 to 1.42 miles per square mile of area.

Effects of Opportunities

An additional 39.5 miles of open motorized roads could be obliterated within the various watersheds (Lakeface-Granite, 0.0 mile; Binarch-Lamb, 5.5 miles; Upper West Branch, 13.5; Lower West Branch, 13.9 miles; and Quartz, 6.6 miles). Obliteration of these roads would decrease open road densities beyond levels projected for the alternatives, and thereby, increase security and habitat effectiveness for lynx. Precommercial thinning opportunities connected with the Douglas-fir beetle project would be subject to review and consultation with the U.S. Fish and Wildlife Service, in accordance with accepted standards and guidelines (see design opportunities, Chapter II). No additional effects on lynx are expected.

Sensitive Species

A summary of the conclusion of effects and viability determination for all Sensitive species can be found at the end of this section (Environmental Consequences for Wildlife, Priest Lake Ranger District).

FISHER/MARTEN

Effects Common To All Action Alternatives Within All Analysis Areas

Little or no reduction in suitable habitat would occur under any action alternative. Existing open road densities within analysis areas are generally high, contributing to relatively high vulnerability and low security for fisher. Design features would manage access to an extent that temporary, barriered, and non-drivable roads used to implement the Decision would remain restricted to motorized use (except for administrative use) during the implementation phase of the project, including post sale activities. Also, temporary roads would be fully obliterated and previously barriered and non-drivable roads would be secured in a manner that would conceal the road and not attract use (front-end obliteration), improving their effectiveness to control motorized use (including winter motorized use). The application of these measures would not reduce security below the existing condition.

In addition, all action alternatives would close (obliterate) between 11.9 and 12.3 miles of existing open road, thus reducing road densities that would contribute to a long term increase in security. Obliterated roads are more effective closures, especially in regards to snowmobile access, and would reduce winter displacement and mortality risk.

There would be only minor reductions in suitable fisher and marten habitat under any action alternative.

Design features implemented as part of all action alternatives would maintain the down wood component throughout the area impacted to provide for fisher and marten denning.

Design features specified for inland fisheries (under the Inland Native Fish Strategy) would in most instances maintain connectivity through riparian corridors and valley bottoms for both fisher and marten.

Following activities such as timber harvest or fire, temporary non-suitable habitat is sometimes created as result. Fisher and marten would generally make little or no use of these areas until the vegetation recovers occurs in approximately 10 years. Some areas may recover sooner than 10 year and others may take longer. This is dependent on site characteristics such as habitat type, severity of the treatments, and prevailing weather conditions.

Table III-221. Acres and percent (in parenthesis) of habitat for fisher and marten in analysis areas of the Priest Lake Ranger District.

Analysis Area	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Lakeface-Granite (15,402 ac)								
Capable Habitat	10,951	10,951	10,951	10,951	10,951	10,951	10,951	10,951
Suitable Habitat	6,871	6,397	6,355	6,355	6,355	6,397	6,397	6,397
	(63)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
Binarch-Lamb (27,548 ac)								
Capable Habitat	18,567	18,567	18,567	18,567	18,567	18,567	18,567	18,567
Suitable Habitat	9,561	8,757	8,757	8,757	8,757	8,757	8,757	8.757
	(52)	(47)	(47)	(47)	(47)	(47)	(47)	(58)
Upper W. Branch (45,435 ac)								
Capable Habitat	34,025	39,951	39,951	39,951	39,951	39,951	39,951	39,951
Suitable Habitat	16,134	14,920	14,896	14,896	14,896	14,906	14,906	14,920
	(47)	(44)	(44)	(44)	(44)	(44)	(44)	(44)
Lower W. Branch (47,843 ac)								
Capable Habitat	29,388	29,388	29,388	29,388	29,388	29,388	29,388	29,388
Suitable Habitat	17,019	15,806	15,561	15,561	15,561	15,579	15,579	15,806
	(58)	(54)	(53)	(53)	(53)	(54)	(53)	(54)
Quartz 5 (9,569 ac)								
Capable Habitat	5,887	5,887	5,887	5,887	5,887	5,887	5,887	5,887
Suitable Habitat	2,840	2,688	2,573	2,573	2,517	2,517	2,517	2,688
	(48)	(46)	(44)	(44)	(43)	(46)	(43)	(46)
Total Capable	98,818	98,818	98,818	98,818	98,818	98,818	98,818	98,818
Total Suitable	52,425	48,568	48,142	48,142	48,086	48,566	48,156	48,568
	(53)	(49.1)	(48.7)	(48.7)	(48.6)	(49.1)	(48.7)	(49.1)

Lakeface-Granite Analysis Area

Effects Common to All Alternatives

Direct and Indirect Effects: Table III-221 displays the amount of habitat existing for fisher and marten, and the amount that would remain under each alternative. The majority of the fisher and marten habitat is located within the western portion of the analysis area, within the Jost Creek Drainage. Denning habitat is located within the Fedar Creek drainages and along Watson Mountain.

Timber harvesting and total miles of open or drivable roads within this analysis area are relatively high. Displacement from suitable habitat, elevated mortality risk, and direct habitat loss are all consequences of high open road densities. Prior to implementation of timber harvest and associated activities, the obliteration and closure of Roads 2249 and 2249a, which is designed to mitigate negative impact on grizzly bear, would reduce overall road densities and thus fisher and marten mortality risk within the project area.

Cumulative Effects: Within the Lakeface-Granite Analysis Area, other ongoing or reasonably foreseeable activities which would have an impact on fisher and marten have been included in the determination of the total amount of habitat which is currently suitable for fisher and marten. No known activities associated with private lands within the analysis area are anticipated to have an impact on fisher and marten or habitat. Winter recreation such as snowmobiling is a popular activity within this analysis area. Maintained snowmobile trails on roads 1347, 638, 302, 2512 provide winter access into a large portion of fisher and marten habitat within this area. It is thought that fisher and marten may be displaced from areas where high levels of winter recreational use occurs, thus these activities may tend to reduce the availability of winter foraging habitat with some areas. Maintained trails for snowmobiling can also provide easy access for winter trapping which is a known source of fisher and marten mortality. Mortality risk is currently moderate due to past activities and snowmobile use in the area. The overall change in mortality risk (winter and summer) would be minor. Overall, cumulative effects are moderate. There would be only minor cumulative effects expected as a result of any activities, including activities on private lands within the analysis area.

Direct and Indirect Effects

Alternative A: Tree mortality and subsequent reduction in overstory cover has resulted in a loss of 474 acres of suitable habitat for fisher and marten. Denning habitat has been reduced from 63 to 58 percent in the analysis area. Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, thus in many instances enhancing the suitability of the habitat for denning.

Alternatives B, C, D and E: Management activities would reduce the amount of suitable denning habitat for fisher and marten by an additional 42 acres. The overall reduction in denning habitat would be slight when viewed at the scale of the analysis area. The proportion of the analysis area remaining suitable for denning would be 58 percent. The impacts to habitat for fisher and marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or lead to the need for federal listing.

Management activities would not result in any measurable changes in the amount of denning habitat available over what has already occurred, or is anticipated to occur, as a result of the beetle-related tree mortality.

Alternatives F and G: No impacts to denning habitat for fisher or marten would occur under implementation of either of these alternatives. The total mileage of drivable roads within this analysis would be reduced by 5.64 miles, thus reducing the overall road density within fisher and marten habitat from 2.95 to 2.71 miles per square mile of area. The impacts to habitat for fisher an marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or lead to the need for federal listing.

Binarch-Lamb Analysis Area

Effects Common to All Action Alternatives

Direct and Indirect Effects: Table III-221 displays the amount of habitat existing for fisher and marten, and the amount that would remain under each alternative. The majority of the fisher and marten foraging habitat is located within the western portion of this analysis area within the Lamb Creek drainage, whereas denning habitat is located generally along Binarch Ridge.

The total miles of open or drivable roads within this analysis area are relatively high. Displacement from suitable habitat, elevated mortality risk, and direct habitat loss are all consequences of high open road densities. Roads which have been identified for closure or obliteration that would be either implemented as

part of the alternative, or implemented as an opportunity, would contribute to a reduction in the total road density within the Binarch-Lamb Analysis Area. This is anticipated to be a positive impact on fisher and marten as road related disturbance and mortality risk would be reduced.

Cumulative Effects: Within the Binarch Lamb Analysis Area other ongoing or reasonably foreseeable activities which would have an impact on fisher and marten have been included in the determination of the total amount of habitat which is currently suitable for fisher and marten. No known activities associated with private lands within the analysis area are anticipated to have an impact on fisher and marten or their habitat. Winter recreation such as snowmobiling is a popular activity within this analysis area. Maintained snowmobile trails on road 639 provides winter access into a large portion of fisher and marten habitat. In addition, open and semi-open areas adjacent to developed trails often receive periodic dispersed snowmobile use. It is thought that fisher and marten may be displaced from areas where high levels of winter recreational use occurs, thus these activities may tend to reduce the availability of winter foraging habitat within high-use areas. Maintained trails for snowmobiling also provides easy access for winter trapping which is a known source of fisher and marten mortality. Mortality risk is currently moderate due to past activities and snowmobile use in the area. The overall change in mortality risk (winter and summer) would be minor. Overall, cumulative effects are moderate. There would be only minor cumulative effects expected as a result of proposed activities, including activities on private lands within the analysis area.

Direct and Indirect Effects

Alternative A: Tree mortality and subsequent reduction in overstory cover has resulted in a loss of 804 acres of suitable denning habitat for fisher and marten. Denning habitat has been reduced from 52 to 47 percent of the analysis area. Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, thus in many instances enhancing the suitability of the habitat for denning.

Alternatives B, C, D, E, F, and G: Management activities would not result in any measurable changes in the amount of denning habitat available over what has already occurred, or is anticipated to occur, as a result of the beetle-related tree mortality. The total mileage of drivable roads within this analysis would be reduced by 1.64 miles, thus reducing the overall road density within fisher and marten habitat from 3.58 to 3.54 square miles. Alternative G would eliminate an additional 1.86 miles of open road, bringing the total open road density within the analysis area to 3.50 miles per square mile of area. The reductions in open road densities would reduce the vulnerability or risk of mortality for fisher and marten. The impacts to habitat for fisher and marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or lead to the need for federal listing.

Upper West Branch Analysis Area

Effects Common to All Action Alternatives

Direct and Indirect Effects: Table III-221 displays the amount of habitat existing for fisher and marten, and the amount that would remain under each alternative. Fisher and marten habitat is generally located along the western portion of the analysis area along the Shedroof divide and associated side ridges in addition to Tola Ridge and South Baldy east to Goose Creek Point. Fisher and marten foraging habitat is generally distributed throughout the analysis area with the exception of Solo and Pelke Creek Drainages.

The total miles of open or drivable roads within this analysis area are relatively high. Displacement from suitable habitat, elevated mortality risk, and direct habitat loss are all consequences of high open road densities. Roads which have been identified for closure or obliteration that would be either implemented as part of the alternative, or implemented as an opportunity, would contribute to a reduction in the total road density within the Upper West Branch Analysis Area. Road closure would reduce road densities. This is

anticipated to be a positive impact on fisher and marten as road related disturbance and the potential mortality risk would be reduced.

Cumulative Effects: Within the Upper West Branch Analysis Area other ongoing or reasonably foreseeable activities which would have an impact on fisher and marten have been included in the determination of the total amount of habitat which is currently considered as suitable or capable. Activities scheduled for 1999 on Crown Pacific Timber Company Lands would also impact an undetermined amount of habitat for fisher and marten. Winter recreation such as snowmobiling is a popular activity within this analysis area. Maintained snowmobile trails on roads 312, 219, 659, 305 and 338 provide winter access into a large portion of fisher and marten habitat. In addition open and semi-open areas adjacent to developed trails often receive periodic high levels of dispersed snowmobile use. It is thought that fisher and marten may be displaced from areas where high levels of winter recreational use occurs, thus these activities may tend to reduce the availability of winter foraging habitat. Maintained trails for snowmobiling also provides easy access for winter trapping which is a known source of fisher and marten mortality. Mortality risk is currently moderate due to past activities and snowmobile use in the area. The overall change in mortality risk (winter and summer) would be minor. Overall, cumulative effects are moderate. There would be only minor cumulative effects expected as a result of any proposed activities, including those on private lands within the analysis area.

Direct and Indirect Effects

Alternative A: Tree mortality and subsequent reduction in overstory cover has resulted in a loss of 1214 acres of suitable denning habitat for fisher and marten. This has resulted in denning habitat being reduced from 47 to 44 percent of the analysis area. Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, thus in many instances enhancing the suitability for fisher and marten denning.

Alternatives B, C and D: Management activities would reduce the amount of fisher denning habitat only slightly (24 acres) within the analysis area. Although the overall proportion of denning habitat within the analysis area would remain relatively unchanged. The total mileage of drivable roads within this analysis would be reduced by 6.63 miles, thus reducing the overall road density within fisher and marten habitat from 3.15 to 3.07 miles per square mile of area. The reductions in open road densities would reduce the vulnerability or risk of mortality for fisher and marten. The impacts to habitat for fisher and marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to lead to the need for federal listing.

Management activities would not result in any measurable changes in the amount of suitable habitat available over what has already occurred, or is anticipated to occur, as a result of the beetle-related tree mortality.

Alternatives E and F: Management activities would reduce the amount of denning habitat for fisher only slightly (14 acres) for Alternatives E and F. The overall proportion of denning habitat within the analysis area would remain relatively unchanged (Table III-221). The total mileage of drivable roads within this analysis would be reduced by 6.63 miles under Alternative E, and by 10.07 miles under Alternative F, thus reducing the overall road density within fisher and marten habitat from 3.15 to 3.07 miles per square mile of area under Alternative E, and to 3.06 miles per square mile of area under Alternative F. The reductions in open road densities would reduce the vulnerability or risk of mortality for fisher and marten. The impacts to habitat for fisher an marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or lead to the need for federal listing.

Alternative G:. Implementation of this alternative would have no impact on denning habitat for fisher or marten within the analysis area. (Table III-221). The total mileage of drivable roads within this analysis would be reduced by 11.05 miles, thus reducing the overall road density within fisher and marten habitat

from 3.15 to 3.01 miles per square mile of area. The reductions in open road densities would reduce the vulnerability or risk of mortality for fisher and marten. The impacts to habitat for fisher an marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or lead to the need for federal listing.

Lower West Branch Analysis Area

Effects Common to All Action Alternatives

Direct and Indirect Effects: Table III-221 displays the amount of habitat existing for fisher and marten, and the amount that would remain under each alternative. Fisher and marten habitat is generally located along the western portion of the analysis area along the Shedroof Divide and associated side ridges in addition to the ridge system from South Baldy east to Goose Creek Point. Generally the interspersion of denning and foraging habitat good.

The total miles of open or drivable roads within this analysis area are relatively high. Displacement from suitable habitat, elevated mortality risk, and direct habitat loss are all consequences of high open road densities. Roads which have been identified for closure or obliteration that would be either implemented as part of the alternative, or implemented as an opportunity, would contribute to a reduction in the total road density. The impacts to habitat for fisher an marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to lead to the need for federal listing.

Cumulative Effects: Within the Lower West Branch Analysis Area other ongoing or reasonably foreseeable activities which would have an impact on fisher and marten have been included in the determination of the total amount of habitat which is currently considered as suitable or capable. Activities such as timber harvest and road construction on Idaho Department of Lands within the Pine Creek drainage would also result in the loss of suitable habitat. Activities scheduled by Stimpson Timber within the Snow Creek area may also impact habitat for fisher and marten. Mortality risk is currently moderate due to past activities and snowmobile use in the area. The overall change in mortality risk (winter and summer) would be minor. Overall, cumulative effects are moderate. There would be only minor cumulative effects expected as a result of proposed activities, including those on private lands within the analysis area.

Direct and Indirect Effects

Alternative A: Tree mortality and subsequent reduction in overstory cover has resulted in a loss of 1213 acres of suitable denning habitat for fisher and marten. Denning habitat would be reduced from 58 to 54 percent of the analysis area. Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, thus in many instances enhancing the suitability for fisher and marten denning

Alternatives B, C, and D: Management activities would reduce the amount of fisher denning habitat only slightly (245) acres within the analysis area. The proportion of suitable denning habitat within the analysis area would be reduced from 54 percent to 53 percent. The analysis area would still be considered as a high integrity habitat for fisher and marten (Table III-221). The total mileage of drivable roads within this analysis would be reduced by 4.53 miles, thus reducing the overall road density within fisher and marten habitat from 3.49 to 3.43 miles per square mile of area. The reductions in open road densities would reduce the vulnerability or risk of mortality for fisher and marten. The impacts to habitat for fisher an marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or lead to the need for federal listing.

Alternatives E and F: Management activities would reduce the amount of fisher denning habitat by 227 acres. The proportion of suitable denning habitat within the analysis area would be reduced from 54 percent to 53 percent. The analysis area would still be considered as a high integrity habitat for fisher and marten (Table III-221). The total mileage of drivable roads within this analysis would be reduced by 4.53 miles for alternative E and by 7.34 miles for alternative F, thus reducing the overall road density within fisher and marten habitat from 3.49 to 3.43 miles per square mile of area under Alternative E, and 3.39 miles per square mile of area under Alternative F. The reductions in open road densities would reduce the vulnerability or risk of mortality for fisher and marten. The impacts to habitat for fisher an marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or lead to the need for federal listing.

Alternative G: Implementation of this alternative would have no impact on denning habitat for fisher or marten within the analysis area (Table III-221). The total mileage of drivable roads within this analysis would be reduced by 7.34 miles, thus reducing the overall road density within fisher and marten habitat from 3.49 to 3.39 miles per square mile of area. The reductions in open road densities would reduce the vulnerability or risk of mortality for fisher and marten. The impacts to habitat for fisher an marten would be relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to reduce viability or result in the need for federal listing.

Quartz Analysis Area

Effects common to All Action Alternatives

Direct and Indirect Effects: Table III-221 displays the amount of habitat existing for fisher and marten, and the amount that would remain under each alternative. The majority of the fisher and marten habitat in the Quartz Analysis Area is located within the vicinity of Jasper Mountain and from Quartz Mountain to Pee Wee Ridge.

The total miles of open or drivable roads within this analysis area are relatively high. Displacement from suitable habitat, elevated mortality risk, and direct habitat loss are all consequences of high open road densities. Roads which have been identified for closure or obliteration that would be either implemented as part of the alternative, or implemented as an opportunity, would contribute to a reduction in the total road density. This is anticipated to be a positive impact on fisher and marten as road-related disturbance and mortality risk would be reduced. Suitable habitat would be maintained under all action alternatives.

Cumulative Effects: Within the Quartz Analysis Area other ongoing or reasonably foreseeable activities which would have an impact on fisher and marten from the standpoint of security include: "Art's" roadside timber salvage, Fear White Pine Salvage, and the Dusty Peak Timber Sale. Mortality risk is currently moderate due to past activities and snowmobile use in the area. The overall change in mortality risk (winter and summer) would be minor. Overall, cumulative effects are moderate. There would be only minor cumulative effects expected as a result of proposed activities, including those on private lands within the analysis area.

Direct and Indirect Effects

Alternative A: Tree mortality and subsequent reduction in overstory cover has resulted in a loss of 152 acres of suitable habitat for fisher and marten. This has resulted in denning habitat being reduced from 48 to 46 percent of the analysis area. Within areas where the tree mortality has been less severe and the overstory cover persists, the additional tree mortality within the stand can be expected to favorably contribute to the down wood component or complex structure on the forest floor, thus in many instances enhancing the suitability for fisher and marten to raise kittens. The impacts to habitat for fisher an marten would be

relatively minor, but because road densities are high, the proposed alternative may impact fisher and marten but are not likely to lead to the need for federal listing.

Alternatives B and C: Management activities would reduce the amount of denning habitat for fisher and marten by 115 acres within the analysis area. The proportion of suitable denning habitat within the analysis area would be reduced from 46 percent to 44 percent. The analysis area would be reduced from a high integrity habitat area for fisher and marten to a moderate integrity habitat area as a result. Road densities would remain unchanged from existing levels. Because habitat integrity would be reduced as a result of timber salvage and harvest, and road densities would remain unchanged, the proposed alternatives may impact fisher and marten but would not likely lead to federal listing.

Alternatives D, E and F: Management activities would reduce the amount of denning habitat for fisher and marten by 171 acres within the analysis area. The proportion of suitable denning habitat within the analysis area would be reduced from 46 percent to 43 percent. The analysis area would be reduced from a high integrity habitat area for fisher and marten to a moderate integrity habitat area as a result. Road densities would remain unchanged from existing levels. Because habitat integrity would be reduced as a result of timber salvage and harvest, and road densities would remain unchanged, the proposed alternatives would have a moderate impact on fisher and marten.

Alternative G: Implementation of this alternative would have no impact on denning habit for fisher or marten within the analysis area. The total mileage of drivable roads would remain unchanged and road densities would be reduced by 7.34 miles, thus reducing the overall road density within fisher and marten habitat from 3.49 to 3.39 miles per square mile of area. Although habitat would be unaffected by this alternative, road densities would remain unchanged from current condition, thus this alternative may impact fisher and marten but is not likely to result in federal listing.

Effects of Opportunities

An additional 39.5 miles of open motorized roads could be obliterated within the various watersheds (Lakeface-Granite, 0.0 mile; Binarch-Lamb, 5.5 miles; Upper West Branch, 13.5; Lower West Branch, 13.9 miles; and Quartz, 6.6 miles). Obliteration of these roads would decrease open road densities beyond levels projected for the alternatives, and thereby, increase security and habitat effectiveness for fisher. No additional effects on fisher are expected.

FLAMMULATED OWL

The following sections analyze the effects of the alternatives on flammulated owls and their habitat. Table III-222 displays the acres of suitable habitat remaining after the treatments proposed in each alternative. Refer to the text for details on individual analysis areas.

Effects Common to All Alternatives

Flammulated owl habitat is widespread in the lower elevations and relatively scarce in all of the analysis areas, with considerably more capable habitat than suitable habitat. Within all of the analysis areas on the Priest Lake District, about 5.7% of the capable habitat is currently modeled as suitable habitat. The primary reasons for considerably more capable than suitable habitat are high canopy cover and lack of dry-site mature and old growth timber. Also, the predictive habitat model used to determine suitable flammulated owl habitat tends to underestimate the amount of suitable habitat because of microsites within the stands. These microsites are not detected by the stand exams, and are not represented in the vegetation data base.

Generally, because flammulated owls require a medium level of canopy closure (between approximately 40% to 60%), a loss of canopy would remove some stands out of suitability while moving other stands into

suitability. This is especially true of many of the capable stands in the moist Priest Lake subbasin, where trees grow very rapidly and canopy tends to be greater than historically in unmanaged stands. A small amount of canopy cover loss as a result of the beetle activity could readily move a stand into suitability. Whereas, a stand already in the suitable condition would have to lose a large quantity of canopy to move outside the suitable range.

Beetles are less likely to attack stands that are in currently suitable canopy cover classes (40% to 60%) because they prefer densely-canopied stands. Thus, stands that are too dense to be currently suitable have a greater likelihood of being targeted by beetles than do currently suitable stands. This also means that the stands most heavily hit, and proposed for regeneration harvesting, would be the ones least likely to be currently suitable. These stands would likely reach the lower end of the canopy cover suitability, or have so many beetle hits that it would no longer be suitable.

Effects Common to All Action Alternatives

There would be no reductions in suitable habitat under any action alternative, however, improved habitat conditions may result under some alternatives. Some stands that are modeled as unsuitable are expected to be suitable when reviewed during layout and design. These stands would not be reduced below the canopy cover appropriate for flammulated owls if they have not already been reduced to that point by beetle activity.

Disturbance at nest sites is a possibility in any timber harvesting operation during nesting season. Flammulated owls are not highly sensitive to disturbance during nesting season (McCallum 1994), but annual production can be lost if a nest tree is unintentionally removed during the nesting period. For most species, annual productivity is not as important as maintenance of habitat over time; and most species can bounce back from occasional disruptions to production.

Of the total of 584 suitable acres within the Priest Lake Ranger District watersheds prior to the beetle outbreak (existing condition), about 84 acres are being gained as a result of the beetle outbreak (Alternative A). Because of the relatively small number of acres of suitable habitat being treated in any of the action alternatives, and the small number of acres of suitable habitat lost in any alternative, the direct effects are likely to be small. Even if direct disturbance were to impact a particular nesting territory, the loss of a single year's productivity at this scale is unlikely to trend the flammulated owl towards federal listing.

The planned use of fire would bring many treated stands closer to their historical conditions with regard to forest floor fuels, and would likely be similar to what flammulated owls are adapted to in this area.

If wildfire did not replace the stand, the change in horizontal structure through tree and shrub growth would eventually remove the same stands from suitability for owls. Consequently, the short-term loss of habitat quality through low intensity prescribed burns is more than offset by a long-term benefit of fuel reductions.

The retention of four or more snags per acre well distributed throughout the habitat would further ensure future use by flammulated owls. This excludes the existing surviving snags that are not used to meet retention objectives and the number of snags produced outside of the treatment areas by expanded beetle activity. Therefore, an increase in the total number of snags over existing condition is expected.

Table III-222. Acres of habitat for flammulated owls in analysis areas of the Priest Lake Ranger District.

Analysis Area	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Lakeface-Granite (15,402 ac)								
Capable Habitat	1,090							
Suitable Habitat	34	23	40	40	40	23	40	23
% of Existing		68	118	118	118	68	118	68
% of No Action		--	174	174	174	100	174	
Binarch-Lamb (27,548 ac)								
Capable Habitat	3,270							
Suitable Habitat	211	163	203	203	203	203	163	163
% of Existing		77	96	96	96	96	77	77
% of No Action		--	124	124	124	124	100	100
Upper West Branch (45,435 ac)								
Capable Habitat	2,090							
Suitable Habitat	199	201	201	201	201	201	201	201
% of Existing		101	101	101	101	101	101	101
% of No Action		--	100	100	100	100	100	100
Lower West Branch (47,843 ac)								
Capable Habitat	3,210							
Suitable Habitat	129	267	311	311	328	315	311	267
% of Existing		207	241	241	254	244	241	207
% of No Action		--	116	116	158	118	116	100
Quartz (9,569 ac)								
Capable Habitat	570							
Suitable Habitat	11	13	13	13	13	13	13	13
% of Existing		118	118	118	118	118	118	118
% of No Action		--	100	100	100	100	100	100
Total Acres								
Capable	10,230							
Suitable	584	667	768	768	785	755	728	667
% of Existing	--	114	132	132	134	129	125	114
% of No Action	--	--	115	115	118	113	109	100

Lakeface-Granite Analysis Area

Alternatives A and G

<u>Direct and Indirect Effects</u>: Table III-222 identifies the acres of existing habitat for flammulated owls, and the acres that would remain under each alternative.

Under Alternatives A and G, more stands would move out of suitability than move into suitability, resulting in a net loss of about 11 suitable acres in the outbreak areas. This is a moderate loss of habitat proportionate to the amount of suitable habitat remaining, and a minor loss relative to the amount of habitat capable of becoming suitable in the next 50-100 years. A loss in canopy cover beyond tolerant levels would be the reason for a reduction in suitable habitat in Lakeface-Granite.

Alternative A would result in an increased number of large snags for use by flammulated owls for nesting or roosting. Large snags are considered an important habitat component. For those stands where canopy is reduced below the minimum, an increase in snags would not produce an increase in habitat quality.

Alternative G has no proposed harvest units in the Lakeface-Granite analysis area, so this alternative would have the same effects as those described for Alternative A.

Cumulative Effects: There are no additional cumulative effects expected from any project within the Lakeface-Granite analysis area. Private land activities were considered to the extent possible, and none within the Lakeface-Granite analysis area were expected to affect flammulated owls or their habitat.

The cumulative effects from the no action alternative are probably greatest in the effects from wildfire risk on flammulated owl habitat. Alternative A greatly increases the risk of a stand-replacing fire (see wildfire analysis).
As biomass continues to be generated on public and private lands, the risk increases. A stand replacing wildfire would create snags but would remove the surrounding live trees flammulated owls depend upon. A stand-replacing wildfire has the potential to greatly reduce the suitable habitat, or set back succession on capable habitat such that it would take a greater number of years to grow large enough to be suitable.

Alternatives B, C, and D

Direct and Indirect Effects: Design features incorporated into the harvest prescriptions are designed to maintain flammulated owl habitat over time. This means that there would be no long-term loss of suitable habitat above the amount that would occur with the no action alternative. However, Alternatives B, C and D show an increase in suitable habitat by 17 acres. This means that there is no decrease in suitable habitat that occurs as a result of management actions, but that an increase in suitable habitat due to beetles reducing canopy cover to acceptable levels.

Understory burning for slash treatment following timber harvesting would temporarily reduce the habitat quality for flammulated owls because the understory vegetation which provides cover and forage for their prey would be reduced. This is the same effect that would happen naturally in these type of stands that historically had frequent fire return intervals. In historic terms, there was more suitable flammulated owl habitat. Consequently, the short-term loss of habitat quality following a low intensity ground fire was probably insignificant. However, due to the current lack of suitable owl habitat over the landscape, these short term losses in habitat quality are more significant.

Cumulative Effects: Cumulative effects under Alternatives B, C and D would be the same as under Alternative A, except that risk of stand-replacing wildfires would be marginally reduced (at the landscape perspective) with the removal of the dead components generated by the beetle outbreak. Although this reduction is relatively small, the amount of fuel loading is great enough that it is important to accomplish fuel reduction, incrementally, over time.

Alternative E

Direct and Indirect Effects: This alternative would have the same direct and indirect effects to flammulated owl as Alternative A, except the risk of wildfire in slash would be reduced as described in the other action alternatives.

Cumulative Effects: Cumulative effects would be the same as those described for Alternatives A, C, and D.

In Alternative E more stands move out of suitability than move into suitability, resulting in a net loss of about 11 suitable acres in the outbreak areas. This loss is a moderate loss of habitat proportionate to the amount of suitable habitat remaining, and minor loss relative to the amount of habitat capable of becoming suitable in the next 50-100 years. A loss in canopy cover beyond tolerant levels is the reason for a reduction in suitable habitat for the Lakeface-Granite area.

Alternative E in the Lakeface-Granite analysis area may impact individuals, because of the disturbance during nesting season, but would not lead to a trend towards federal listing, because generally the reduced

canopy closure is slightly increasing the amount of suitable habitat available in the short term, and because of a decreased risk of wildfire in the treated stands.

Alternative F

Direct and Indirect Effects: Direct and indirect effects in this alternative share features of both Alternative A (for those areas not treated) and Alternative D (for those areas that are treated). For the Lakeface Granite analysis area, the number of suitable acres after the project is the same as for Alternative A.

Cumulative Effects: Cumulative effects would be the same as that described for Alternatives A and D for untreated areas and treated areas, respectively.

Alternative F in the Lakeface-Granite analysis area may impact individuals, because of the risk of disturbance in nesting habitat, but would not lead to a trend towards federal listing, because generally the reduced canopy closure is slightly increasing the amount of suitable habitat available in the short term, and because there is a reduced risk of wildfire in the treated stands.

Binarch-Lamb Analysis Area

Direct and Indirect Effects: Table III-222 identifies the acres of existing habitat for flammulated owls, and the acres that would remain under each alternative. The same effects to the flammulated owl outlined for the Lakeface-Granite analysis area apply to the Binarch-Lamb analysis area, with the following differences. This analysis area has a low proportion of suitable habitat to capable habitat (6 percent). This is primarily because the canopy cover is greater than optimal for this species. Suitable and capable habitat is distributed in this analysis area primarily in the western and southern portions, and most of the treatment areas do not overlap either capable or suitable habitat.

As with the Lakeface-Granite analysis area, Alternative A would be the greatest force for change in terms of flammulated owl habitat. Alternative A would lose 48 acres of suitable habitat from beetle-related tree mortality. Most of this is regained through management action on other acres in Alternatives B through E, with a net loss of 8 acres as compared to the existing condition.

In general, all of the action alternatives, except for Alternative G, would increase suitable habitat relative to Alternative A. Alternative G would retain the amount of suitable habitat as in Alternative A because there are not treatment areas in this analysis area.

Cumulative Effects: The cumulative effects to flammulated owls in the Binarch-Lamb Analysis area are the same as those described for the Lakeface-Granite analysis area alternatives. There were no projects within this analysis area expected to affect flammulated owl habitat.

Upper West Branch Analysis Area

Direct and Indirect Effects: Table III-222 identifies the acres of existing habitat for flammulated owls, and the acres that would remain under each alternative. The same effects to the flammulated owl outlined for the Lakeface-Granite analysis area apply to the Upper West Branch analysis area, with the following differences.

This analysis area has the highest proportion of suitable habitat to capable habitat (10 percent) of any of the analysis areas. All alternatives possess virtually the same amount of suitable habitat. Consequently, there are no measurable differences between alternatives.

Old growth is treated in this analysis area (Alternatives B, C, and D), however, none of the treated stands contain suitable habitat. Some treatments of these stands may improve habitat over time, particularly if the risk of wildfire is reduced.

Cumulative Effects: The cumulative effects described in the Lakeface-Granite area also apply to the Upper West Branch area, except for the following differences. A foreseeable future action on private lands is not expected to add to the cumulative effects because of the projected negligible amount of habitat affected (4,000 board feet of blowdown removal). A foreseeable future Forest Service action included in the analysis is the Rocky Vista II salvage.

Overall, cumulative effects would be the same as described for the Lakeface-Granite area for all alternatives.

Lower West Branch Analysis Area

Direct and Indirect Effects

Table III-222 identifies the acres of existing habitat for flammulated owls, and the acres that would remain under each alternative. The same general effects to the flammulated owl outlined for the Lakeface-Granite analysis area apply to the Lower West Branch analysis area, with the following differences. This analysis area has the relatively low proportion of suitable habitat to capable habitat (4 percent). The Flat Goose area has known observations of flammulated owls, two of which are in treatment areas. This analysis area also has the largest positive change of suitable habitat.

Alternative A: In addition to the above effects, Alternative A would specifically have an increase of 138 acres of suitable habitat, primarily from a decrease of canopy closure into the suitable range. This is almost double the amount of suitable habitat existing prior to the beetle infestation.

Alternative B, C, F: In addition to the above general effects for this analysis area, Alternatives B, C and F would have an increase of 182 acres over the amount of suitable habitat existing prior to the beetle infestation, and an increase of 44 acres of suitable habitat over Alternative A. This increase is the result of reduced canopy coverage into the suitable habitat range. Underburning in these alternatives in the treatment units would increase the value of the stands for flammulated owls over time, because it would trend the stands towards more historic understory vegetation levels. Short term losses of understory productivity would be minor relative to the benefits derived from this trend.

Alternative D: In addition to the above general effects for this analysis area, Alternative D would have an increase of 199 suitable acres over the amount of suitable habitat existing prior to the beetle infestation, and an increase of 61 acres over the no action alternative. These increases are primarily in two units. The increased suitability in larger patches than in the other analysis areas makes the increase in habitat more useful than smaller patches.

Alternative E: In addition to the general effects described above, Alternative E would have an increase of 186 suitable acres over the amount of suitable habitat existing prior to the beetle infestation, and an increase of 48 acres over the no action alternative. This increase is primarily in one unit.

Alternative G: Three of the four units proposed under Alternative G are present in this analysis area. For all the other areas of beetle activity, the effects would be as described for Alternative A in this analysis area. For the three units treated in Alternative G, the stands would be improved for flammulated owls, with a possible short-term loss of suitability. This is because as a rule, the amount of understory is too dense in the Priest Lake subbasin to be optimal for flammulated owls. Underburning would be a benefit because it would reduce the excess of understory. However, because of the same reason the habitat is no longer suitable for flammulated owls in the typical condition of too dense understory, very few stands are able to have a

treatment of burning without having too much biomass to obtain the optimal stand structure through burning alone. If the stands are low enough density to be suitable for the type of burning treatment prescribed under this alternative, then they are also likely to be in reasonably good suitable condition for flammulated owls already. The understory burns prescribed are likely to have a good chance of maintaining suitable structure over time, because frequent low-intensity underburns were the reason stands maintained appropriate structure for flammulated owls under historical conditions.

None of the proposed watershed restoration features of this alternative would affect flammulated owls.

Cumulative Effects

The effects outlined for the Lakeface-Granite analysis area apply to the Lower West Branch area as well, with the following differences in management activities: There are more projects with the potential to affect flammulated owl habitat. These are: Idaho Department of Lands salvage sales in Pine Creek, Stimson Lumber Company timber harvest (30 acres) with road construction, Foreseeable future Forest Service projects included in the analysis area include Butch Creek, Stone Bead, Murry Creek, Peterson Road Pine, and Ponderosa Connection.

Quartz Analysis Area

Direct and Indirect Effects: Table III-222 identifies the acres of existing habitat for flammulated owls, and the acres that would remain under each alternative. The same effects to the flammulated owl outlined for the Lakeface-Granite analysis area apply to the Quartz analysis area, with the following differences: This analysis area has the least proportions of suitable habitat to capable and habitat (2 percent). The suitable habitat is scattered in relatively small patches within the analysis area. One known observation of owls in this analysis area is within a treatment area. All alternatives possess virtually the same amount of suitable habitat. Consequently, there are no measurable differences between alternatives.

Alternative G proposes one unit in this analysis area. The effects from this alternative that were detailed for the Lower West Branch alternative G units applies to the Quartz analysis area as well.

Cumulative Effects: The same effects as described for the Lower West Branch analysis area are applicable in this area. No activities (including private lands) are expected to cumulatively impact flammulated owls or their habitat in this analysis area.

Effects of Opportunities

There are no anticipated effects to flammulated owls as a result of activities identified as opportunities.

NORTHERN GOSHAWK

The following sections analyze the effects of the alternatives on northern goshawks and their habitat. Table III-222 displays the acres remaining of suitable habitat after the treatments proposed in each alternative. Refer to the text for details on individual analysis areas. Reasonably foreseeable activities are included in the existing condition figures.

Effects and Features Common to All Analysis Areas

Northern goshawk habitat is widespread and common in all of the analysis areas, with considerably more capable habitat than suitable habitat (47% of the capable habitat is classified as suitable habitat). Losses in suitable goshawk habitat, as defined in this Final EIS, are mostly a result of the beetle activity. Suitable

habitat is reduced by approximately 3,544 acres under Alternative A over the five analysis areas, with a relatively even distribution of losses. This amounts to an approximate 9% loss of existing suitable habitat. An additional 296 acres would be lost under the most impactive alternatives (Alternatives B, C, and D). This loss represents less than 1% of the suitable habitat prior to the beetle activity or beyond Alternative A.

Six known nest territories are within the analysis areas; four of these are near activity units of one or more alternatives (also considering reasonably foreseeable future actions). The predictive habitat model used to determine suitable goshawk habitat tends to underestimate the amount of suitable habitat. This model limitation is somewhat compensated for by the design feature that newly discovered goshawk nest sites would be subject to the same limited operating season as known sites. The majority of the suitable goshawk habitat lies in the Upper West Branch and Lower West Branch Analysis Areas.

For all alternatives, the number of stands with nest sites remains well above the minimum necessary for maintenance of the goshawk as a nesting species in any of the analysis areas. The concept of nest stands is somewhat difficult to consider in this area because of the continuity of densely forested cover. Most stands are continuous, and provide nesting goshawks with the opportunity to choose many sites within a contiguous stand of up to thousands of acres in size. Thus the analysis considers the number of stands that are too small to function as suitable habitat and are subtracted from the total number of suitable acres in the table above.

Table III-223. Acres and percent of habitat for northern goshawks in analysis areas of the Priest Lake Ranger District.

Analysis Area	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Lakeface-Granite (15,402 ac)								
Capable Habitat	9,996							
Suitable Habitat	6,047	5,747	5,704	5,704	5,704	5,747	5,747	5,747
% of Existing		95	94	94	94	95	95	95
% of No Action			99	99	99	100	100	100
Binarch-Lamb (27,548 ac)								
Capable Habitat	17,774							
Suitable Habitat	8,274	7,489	7,489	7,489	7,489	7,489	7,489	7,489
% of Existing		93	92	92	92	93	93	93
% of No Action			99	99	99	~100	~100	100
Upper West Branch (45,435 ac)								
Capable Habitat	26,591							
Suitable Habitat	11,328	10,517	1,0415	10,447	10,447	10,497	10,505	10,517
% of Existing		93	92	92	92	93	93	93
% of No Action			99	99	99	~100	~100	100
Lower West Branch (47,843 ac)								
Capable Habitat	24,320							
Suitable Habitat	13,098	12,362	12,303	12,332	12,332	12,304	12,348	12,362
% of Existing		94	94	94	94	94	94	94
% of No Action			99	~100	~100	99	~100	100
Quartz 5 (9,569 ac)								
Capable Habitat	5,012							
Suitable Habitat	2,117	2,001	1,907	1,907	1,907	2,001	1,907	2,001
% of Existing		94	90	90	90	94	90	94
% of No Action			95	95	95	100	95	100
Total Acres								
Capable	83,756							
Suitable	40,864	38,118	37,818	37,879	37,879	38,036	37,996	38,118
% Existing		93	92	93	93	93	93	93
% No Action			99	99	97	~100	~100	100

The total number of undersized stands in all the analysis areas is 197 under existing conditions; this represents an approximate acreage of 3,940 (or 10 percent of existing suitable habitat). Beetle activity increases the number of undersized patches to 208 (Alternative A), with an approximate 4,160 acres; remaining at 10% of suitable. There were no additional undersized patches created by any action alternative.

In all alternatives, for all analysis areas, the number of patches remains well above the minimum for maintaining a healthy goshawk population.

Lakeface-Granite Analysis Area

Alternatives A and G

Direct and Indirect Effects: Table III-223 displays the amount of habitat existing for northern goshawk, and the amount that would remain under each alternative. The majority of the suitable goshawk habitat lies in the central and eastern part of the analysis area. There is one known goshawk nesting territory. It lies about 2 miles away from any of the treatment areas.

Some loss of canopy would occur. Generally, because northern goshawks require a high level of canopy closure (greater than 60-70%), a loss of canopy would remove many stands from suitability. Those stands that had canopy closure above this minimum level would remain suitable nesting habitat. Those stands with canopy closure lower than this, but with interspersed standing live trees, would still function as foraging habitat. As a conservative approach, this analysis considers those stands that have as little as 50% canopy cover to be suitable habitat. Alternative A would result in a change of suitable nesting habitat from 6,047 acres to 5,747 acres, or a loss of 5% of existing suitable acres. This represents large loss of habitat proportionate to the amount of suitable habitat remaining in the Lakeface-Granite analysis area. However, this is a relatively small portion of the capable habitat. The Lakeface-Granite analysis area has a large amount of mature trees capable of producing suitable habitat within several decades.

Alternative A greatly increases the risk of a stand-replacing fire (see wildfire analysis). A stand-replacing wildfire has the potential to greatly reduce the suitable habitat, or set back succession on capable habitat such that it would take a greater number of years to grow large enough to be suitable. A stand-replacing fire would reduce the value of the stands for up to a century. In the Priest subbasin, there is a high proportion of old growth and older sawtimber relative to most parts of the Upper Columbia River Basin, so this effect may be less damaging to northern goshawks than it would be in an area of very limited old growth.

There are twelve stands that are too small to function as suitable nest stands (one more than in the existing condition). Two patches hit by beetles were already too small to be considered suitable habitat. The number of stands would remain abundant for three territories.

No units for Alternative G are present in this analysis area, so the effects of Alternative G are the same as Alternative A in this analysis area.

Cumulative Effects: The cumulative effects of the no action alternative combined with human projects have resulted over time in a reduction in habitat for this species. The total amount of available habitat is adequate to provide for at least one pair in this analysis area over time. It is highly likely that this is a minimum number and more territories are present and productive, because of the generally rich forage base and large number of snags and large woody components in the analysis area. Nevertheless, the no action alternative is likely to have resulted in a loss of habitat for individuals to the point where one or more nest stands could have been lost. One timber sale project is known to have potential impacts to northern goshawks, Dusty Peak timber sale, a loss of 52 acres of suitable habitat. Considering all activities (including private lands), cumulative effects would be moderate, and viable populations would remain. There are adequate numbers of stands and acreage to offset any reasonably foreseeable actions on private land in this analysis area, i.e., to provide adequate remaining habitat on public lands. The effects of the beetle activity (under the No Action Alternative) are likely to impact individuals but not likely to trend the species towards federal listing. No additional cumulative effects are expected for this alternative.

Alternative B

Direct and Indirect Effects: The effects outlined for Alternative A apply to Alternative B with the following differences. Where those stands that have lost greater than 50% of the canopy to beetle kill and are subsequently regeneration harvested, suitable nesting habitat would remain unchanged because the canopy closure with the beetle kill would make the stand unsuitable. Further regeneration harvesting would not change the suitability other than it may shorten the time between the stand growing back into suitable over the next century. These stands would move from suitable foraging habitat with dangerous quantities of dead and down woody materials to suitable foraging habitat with acceptable quantities of dead and down.

Alternative B reduces the number of suitable acres down to 5,704 acres, an additional loss of 42 acres from the effects of beetle activity. This can be compared to a nesting stand size of about 30 acres. Because some of the loss in suitability is in two stands that are too small to be used currently, this amount of loss is essentially absorbed by the small stands, so over the whole analysis area the amount of loss would be less than the

equivalent of one nest stand. The number of undersized stands does not change from the no action alternative.

Disturbance at nest sites is a possibility in any timber harvesting operation during nesting season. Where nest stands are known to occur, within about 1 mile of a nest site, limiting operating seasons to outside the period of greatest disturbance would reduce this effect to acceptable levels. The relatively large number of known goshawk nests in the North Zone indicates that this species has a population buffer that could absorb the inadvertent loss of one year's productivity due to disturbance, if habitat remained suitable. The known nest site in the Lakeface-Granite analysis area is too far from any treatment area to be affected by disturbance.

Indirect effects would be similar to Alternative A except that the risk of a stand-replacing fire would be considerably reduced within the stand itself because of the removal of the huge quantities of fuel. This would bring many stands closer to their historical conditions with regards to forest floor fuels, and would likely be similar to what northern goshawks are adapted to in this area. Fires that did occur would be more likely to be lower intensity fires, which often increase the value for several species of wildlife. Grouse and snowshoe hare are species which would be favored by more frequent, low intensity fires, and both are locally important prey species for northern goshawk. Snowshoe hares are more available to predation by goshawks in more open stands, even though they do not reach their greatest abundance in these types of conditions.

Because this alternative treats only those outbreaks currently known and not the additional beetle infested stands identified in Alternative D, the effects of Alternative B would have elements of the No Action Alternative for those stands not treated but subsequently infested. The degree that this would affect goshawks depends in large part on the location and intensity of future hits.

The marking of 4 snags per acre well distributed throughout the habitat would further ensure future use by goshawks.

The subsequent closure of several roads in this alternative would indirectly be a benefit to goshawks because it would reduce the amount of human disturbance during nesting season.

<u>Cumulative Effects</u>: The cumulative effects would be the same as for Alternative A, as would the determination of effect.

Alternative C

<u>Direct, Indirect and Cumulative Effects:</u> This alternative would have the same direct, indirect, and cumulative effects to northern goshawk as Alternative B, except for the following. For those units that drop out of this alternative, the effects would be the same as the no action alternative. Because fewer roads would be constructed, there would be less disturbance from ground-based vehicles. This would be replaced by the disturbance from helicopter logging. Helicopters can cause abandonment at nest sites even if the habitat at the site is not altered, but may be reoccupied in subsequent years (pers. comm. with S. Jacobson, 1998). Future closure of roads and the resultant reduced disturbance would be less than Alternative B, and greater than Alternative A. Cumulative effects and the determination of effects is the same as Alternative A.

Alternative D

<u>Direct, Indirect and Cumulative Effects:</u> This alternative would have the same direct, indirect, and cumulative effects to northern goshawk as Alternative B, given the current modeling efforts. However, the number of acres of suitable habitat removed is likely to be greater than the number of acres indicated if the beetle infestation is worse than expected. This could result in a greater loss of suitable habitat, and the worst of the alternatives in regards to loss of goshawk habitat. The amount of suitable habitat is still relatively large in this analysis area, and a loss of suitable habitat down to about 5,704 from 6,047 acres would retain the analysis area's ability to maintain three nesting territories. Individual goshawks may be affected by a loss

down to this level, without affecting the entire analysis area's ability to maintain a viable presence, thus this alternative may impact individuals but would not trend the species towards federal listing.

Alternative E

Direct, Indirect and Cumulative Effects: This alternative would have the same direct, indirect and cumulative effects to northern goshawk as Alternative B, except for the following. The determination of effect would remain the same.

This alternative would treat fewer acres than Alternative B, and so would have similar effects to Alternative A for those stands that were not treated. It would also have fewer acres treated within the stands treated, because fewer individual trees would be removed, again making the effects more similar to Alternative A for those portions of the stands. These effects do not reduce suitability of the stands treated for goshawk nesting habitat, however.

Alternative F

Direct, Indirect and Cumulative Effects: This alternative would have identical effects on habitat suitability as Alternative A in this analysis area..

Binarch-Lamb Analysis Area

Effects and Features Common to All Alternatives

Table III-223 displays the amount of habitat existing for northern goshawk, and the amount that would remain under each alternative. The same effects to the northern goshawk outlined for the Lakeface-Granite analysis area apply to the Binarch-Lamb analysis area with the following differences. Suitable and capable habitat is well-distributed in this analysis area. One known nesting territory occurs within a large treatment unit, Bina 20a.

The Binarch-Lamb analysis area is large enough to hold 6 goshawk territories. At a minimum, six territories would need 540 acres of suitable habitat. All alternatives would provide well over this amount, in primarily contiguous stands. There are twenty-three stands of suitable habitat too small to be used for nesting in this analysis area.

Cumulative Effects: Cumulative effects are the same as outlined for the Lakeface-Granite analysis area, with the following differences. Private lands within this analysis area may have unknown effects on northern goshawk nesting habitat; however, there is considerably greater habitat than minimum available on public lands that could buffer these actions. No planned or reasonably foreseeable activities are expected to impact any suitable habitat for goshawks in this analysis area.

Alternatives A and G

This alternative would have the same direct and indirect effects to northern goshawk described for the Lakeface-Granite analysis area with the following differences. Alternative A would result in a change of suitable habitat from 8,274 to 7,489 acres (90% of currently suitable) (Table III-223). This loss is a moderate loss of habitat proportionate to the amount of suitable habitat remaining, and habitat capable of becoming suitable in the next 50-100 years.

Some loss in habitat suitability in this analysis area occurs within three stands that are currently considered too small to be used as nesting stands. This reduces the effects of the loss of suitability a small amount, although the total number of these stands is small relative to the large amount of continuous forested stands

available for nesting. Two additional undersized stands are created by beetle activity over existing condition because of creation of discontinuous suitable habitat, so the net loss of habitat relative to patch size is approximately the same as under existing conditions.

There are no units for Alternative G in this analysis area, so the effects of this Alternative are the same in this analysis area as for Alternative A.

The effects of the beetle activity, i.e. the No Action Alternative, may impact individuals, but would not trend the species towards federal listing.

Alternatives B, C, D, E, and F

Direct and Indirect Effects: The amount of suitable habitat lost in all of these action alternatives would be the same as for Alternative A. The effects of the beetles contributed the most impact even considering the disturbance potential.

The known nesting territory in this analysis area would have a limited operating period per the design features. This would reduce disturbance at the nest site to acceptable levels and allow the pair to continue to produce young for that year. This would only apply for Alternative D, because the other alternatives do not have units in the vicinity of the nest. Because there is suitable habitat remaining in a post-fledging area of 400 acres around this nest, long-term loss would not be likely to occur.

Cumulative Effects: While it is unlikely that the pair would abandon the site because of habitat changes of this magnitude over the entire analysis area, the amount of habitat loss in Alternative D is likely to impact individuals using the analysis area for nesting. Suitable habitat remaining is greater than the amount of acres of suitable nesting habitat recommended as a minimum for northern goshawk habitat in a cumulative effects area (Warren, 1990 p. 22). The amount of capable habitat available for future goshawk nesting habitat also indicates that more habitat could be managed if needed for additional habitat.

Considering all activities, including private lands, the cumulative effects of Alternatives A, B, C , E and F would be moderate.

The action alternatives may impact individuals, but would be unlikely to trend the species towards federal listing.

Upper West Branch Analysis Area

Effects Common to All Alternatives

Direct and Indirect Effects: Table III-223 displays the amount of habitat existing for northern goshawk, and the amount that would remain under each alternative. The same effects to the northern goshawk outlined for the Lakeface-Granite analysis area apply to the Upper West Branch analysis area with the following differences. Along with Lower West Branch Analysis area, these two analysis areas contain large quantities of capable and currently suitable goshawk habitat. There are no known northern goshawk nesting territories near any proposed harvest units within this analysis area. One known territory is within a project that is reasonably foreseeable; the project would not change the suitability of the nest stand. However, based on the amount of suitable habitat and the number of known territories in the North Zone, it is likely that several territories occur within the 26,591 acres of capable habitat.

There is room for nine goshawk territories in this analysis area. This would require approximately 810 acres of suitable-sized stands. Under all alternatives, more than ten times this amount of suitable habitat remains. There are 75 patches of habitat too small to be considered as nest stands, including thirteen that have beetle

activity in them and are reduced in habitat suitability. Beetle activities resulted in another two patches by creating openings between previously contiguous patches.

Cumulative Effects: The cumulative effects would be as described for the Lakeface-Granite analysis area, with the following differences. Several timber sales have the potential to impact goshawk habitat in this analysis area: Green Goose Salvage and Solo Grouse salvage sales on national forest system lands, and a Crown Pacific small sale in the Upper West Branch. The projects on national forest system lands are already considered in the modeling process. The loss of suitable habitat from these projects is fairly large, resulting in a loss of 371 acres of suitable habitat. Proportionate to the amount of habitat remaining, this is still allowing for numerous territories within the analysis area. The project on private land has an unknown effect on the total goshawk habitat remaining, however, along with the no action alternative it would appear there is adequate capable and suitable habitat remaining on national forest system lands alone to allow for continued viability in this analysis area even if all private lands were harvested below suitability. While a worse case would have some adverse effect on discontinuity of individual territories, it would not be likely to affect viability. No additional cumulative effects are expected under any alternatives.

For all alternatives within the Upper West Branch analysis area, the project (Alternatives A through G) may impact individuals, but would not lead to a trend towards federal listing.

Alternatives A and G

Direct and Indirect Effects: This alternative would have the same direct and indirect effects to northern goshawk as described for the Lakeface-Granite analysis area, except for the following. Alternative A would result in the largest loss of suitable habitat from 11328 acres to 10,517 (93% of existing suitable) acres (Table III-223). This is a moderate loss of habitat proportionate to the amount of suitable habitat remaining, and habitat capable of becoming suitable in the next 50-100 years.

There are no units for Alternative G in this analysis area, so the effects of this Alternative are the same in this analysis area as for Alternative A.

Alternatives B , C, D, F

Direct and Indirect Effects: The same effects described for the Lakeface-Granite analysis areas would apply in this area, with the following differences.

There are slight differences in the number of acres of suitable habitat remaining after these four action alternatives, however, the differences are proportionately minor (12 to 32 acres, or to just under 100% of Alternative A values).

These four action alternatives treat dry site old growth. This would have important effects to the old growth stands, because of the high fuel loading for those stands. Since old growth stands are disproportionately more valuable for goshawk habitat than mature stands, the loss of these stands in the event of a stand-replacing fire would have greater adverse impact to the Upper West Branch's northern goshawk population than the loss of a similar number of acres of mature habitat.

There is no disturbance potential to a known nesting territory from timber harvesting in this analysis area. The possibility of locating a new nesting territory during the project operation can be dealt with through application of the same design criteria applied to known nests. This would reduce the disturbance potential and would likely allow the production of that year's offspring. Even if protection of one year's offspring were to occur, if the habitat changed such that it was no longer suitable, it is unlikely the birds would return long term. This is true of the no action alternative as well as the action alternatives.

Cumulative Effects: As noted before, the Priest Lake subbasin has a greater amount of old growth than do most areas, and because it is rare in its proportion of old growth, the effect on goshawks and other old growth dependent wildlife would have greater consequences regionally. The loss of old growth stands would make the Priest Lake subbasin similar to most areas regionally in terms of the proportion of old growth stands, thus making the wildlife fauna likely more similar to those other areas.

Alternative E

Direct and Indirect Effects: The same effects outlined for the Upper West Branch analysis area other alternatives are present for Alternative E with the following differences. Alternative E does not treat old growth, and so the benefits described for the action alternatives that treat old growth would not be present. This would increase the risk of wildfire, particularly stand-replacing wildfire, and competition for nutrients in those stands. However, without treatment there would be no disturbance potential for nesting goshawks (although design criteria are intended to reduce this risk). The long-term loss of nesting habitat from lack of management of these stands is greater than the short-term loss of a year's productivity from disturbance.

Cumulative Effects: As described for the other alternatives.

Lower West Branch Analysis Area

Effects Common to All Alternatives

Direct and Indirect Effects: Table III-223 displays the amount of habitat existing for northern goshawk, and the amount that would remain under each alternative. The same effects to the northern goshawk outlined for the Lakeface-Granite, and Upper West Branch analysis areas apply to the Lower West Branch analysis area with the following differences. Along with Upper West Branch Analysis area, these two analysis areas contain large quantities of capable and currently suitable goshawk habitat. They are also the two analysis areas that treatment of old growth is proposed. There is one known northern goshawk nesting territory within this analysis area. It is outside of any treatment areas, but within one mile of two small treatment units (Ojib 16a and 17). A post-fledging area surrounding this territory indicates there is ample habitat remaining under any alternative.

Based on the amount of suitable habitat and the number of known territories in the North Zone, it is likely that several more territories occur within the 24,320 acres of capable habitat of this analysis area. In gross acreage, there would be room for at least ten territories of 5,000 acres each in this analysis area. This would require a minimum of 900 acres of suitable nesting habitat distributed in 30 acre minimum stands; there is about ten times this amount of suitable nesting habitat remaining under any alternative. Most stands are contiguous.

There are 80 undersized suitable habitat stands in this analysis area, representing about 1,600 acres (approximately 12%) of suitable habitat essentially unavailable for use as nesting stands. Four of these stands were hit by beetles enough to reduce habitat suitability. Three additional stands were created when beetle-related damage disrupted the expanse of suitable contiguous stands.

Cumulative Effects: The planned or ongoing projects within the Lower West Branch analysis area that have the potential to affect northern goshawk habitat are: Moore Over, Butch Creek, Ojibway Bugs, Rogers Mosquito, Murry Creek, Ponderosa Connection, "12 Mile" timber sales on national forest system lands. All of these projects have incorporated goshawk habitat into the planning process. The combined loss of existing suitable habitat is 150 acres in this analysis area for these projects, already incorporated into the figures of suitable habitat for existing condition. No known private land proposals are expected to affect goshawk habitat. Because all of the action alternatives retain nearly 100% of the suitable habitat remaining after the beetle kill, there should still remain adequate habitat to maintain more than the minimum number of

goshawk territories in this analysis area. There is a large reservoir of capable habitat (24,320 acres) available for short or long-term habitat manipulation. No additional cumulative effects are expected.

Alternative A

Direct and Indirect Effects: The no action alternative produces the greatest amount of habitat loss from existing condition, at 736 acres, or 6% of existing suitable habitat. The remaining amount of habitat would be adequate to retain a viable goshawk population in the analysis area, although this amount may have a minor effect on the number of individuals present in the analysis area.

Alternatives B, C, D , E and F

Direct, Indirect and Cumulative Effects: The direct, indirect and cumulative effects described for all alternatives apply, with the following additional effects for the action alternatives.

A small amount of suitable habitat is lost because of management effects for Alternatives B, C, D, E and F. This amount is greatest in Alternative E at 58 acres, and least in Alternative F at 14 acres. This is a small amount (less than 1%) in proportion to the amount of habitat remaining suitable after all activities are considered in the Lower West Branch analysis area. It is highly unlikely that this amount of habitat loss would have a measurable effect in goshawk populations.

The disturbance potential for the known territory in the Lower West Branch analysis area is less than for those territories within treatment units, but greater than the situation described for Lakeface-Granite. The Ojibway nest territory is at the outer edge of disturbance potential, and a limited operating season would reduce this disturbance potential to acceptable levels, below those of the nest territories within treatment units. Disturbance potential would occur only with Alternative D. Habitat suitability would not be changed, so it is likely that the pair would return to the territory even if one year's production was lost through disturbance. Overall, cumulative effects would be the same as those described for the Binarch-Lamb area, with the exceptions listed above.

Alternative G

Direct, Indirect and Cumulative Effects: The effects of this alternative are the same as outlined above for the no action alternative with the following differences. Three units are in Lower West Branch analysis area. Approximately one-third of the units proposed are not capable or currently suitable habitat for goshawk. For these areas, the only effect on goshawks would be disturbance if there was a nest nearby; no known territories are within disturbance distance of these units. For the portions of the units that are currently suitable, the proposed action would not substantially change their suitability to provide nesting habitat. Treatment of the understory would be likely to assist in maintaining the stands in a more similar way to their historical conditions, resulting in a benefit to the goshawk.

This alternative would likely impact individuals (as previously described), but would not lead to a trend towards federal listing.

Quartz Analysis Area

Effects Common to All Alternatives

Direct and Indirect Effects: Table III-223 displays the amount of habitat existing for northern goshawk, and the amount that would remain under each alternative. The same effects to the northern goshawk outlined for the Lakeface-Granite analysis area apply to the Quartz analysis area with the following differences. Although this analysis area has the smallest absolute amount of capable and suitable habitat of the Priest Lake Ranger

District analysis areas, it is similarly common and well-distributed within the analysis area. This analysis area has a large enough gross area to be considered as a cumulative effects area, but it has about half as many capable habitat acres as is usually considered adequate (5012 acres). The proportion of suitable to capable acres is similar to the remainder of the analysis areas, but is the lowest proportion at 42% suitable to capable (in existing condition). There is a known goshawk territory within a treatment area in the Quartz Analysis Area, and another territory away from any treatment areas.

This analysis area has room for approximately two nesting territories. These two territories would require a minimum suitable habitat acreage of 180 acres. There would be more than 10 times this amount of suitable habitat remaining under any alternative in this analysis area. The Quartz analysis area has eight undersized suitable habitat stands. The effects of the beetle activity create an additional two undersized stands because of discontinuity, for a total of ten undersized stands. These two stands are within the post-fledging area of one of the goshawk territories, and are created out of one larger stand. The proximity of these stands may increase the risk of the territory becoming unusable by the resident pair. However, there is adequate habitat within the analysis area to support a relocated nest territory even in the worst case of abandonment.

One unit in Alternative G is proposed for this analysis area. Approximately two-thirds of the proposed unit is unsuitable and incapable goshawk habitat. The effects of this alternative would be the same as that described for Alternative A for all the untreated areas, as described under Lakeface-Granite and others, and the same as Lower West Branch for the treatment areas of Alternative G.

Cumulative Effects: There is only one existing or proposed projects on national forest system lands that has the potential to affect northern goshawks in the Quartz analysis area; the timber sale Six Quartz. This project has considered goshawk effects from the Six Quartz project and no additional impacts are expected. The reduction in suitable habitat from this project is 59 acres, already considered in the figures for existing condition. No further cumulative effects are expected.

All alternatives would likely impact individuals, but would not trend the species towards federal listing.

Alternative A

Direct and Indirect Effects: The no action alternative produces the greatest amount of habitat loss from existing condition, at 117 acres, or 6% of existing suitable habitat. The remaining amount of habitat would be adequate to retain a viable goshawk population in the analysis area, including the two known territories present. It is likely that this size of analysis area could not support many more individuals than these pairs, particularly with the effects of the beetle activity. The known territory on the western edge of the analysis area is unaffected by beetle activity as known currently.

Beetle activity substantially changes the character of the known territory on the east side of the analysis area (i.e. near treatment units). Beetle activity has moved some stands far enough out of suitability that there is not only a reduction in absolute number of acres of suitable habitat, but also in contiguity of those stands. One stand has been hit such that it has reduced the size suitability of a nearby stand to the known nest. Although this territory has suffered a loss of habitat, there remains adequate suitable and capable habitat around the site to meet a 400 acre post-fledging area. This implies that it is likely to remain viable.

Alternatives B, C, D and F

Direct and Indirect Effects: The known nesting territory in this analysis area would have a limited operating period per the design features. This would reduce disturbance at the nest site to acceptable levels and allow the pair to continue to produce young for that year.

Direct effects to the known territory are in the loss of suitable habitat in a nearby unit. For additional protection to the territory, in the post-fledging area there would be a limit of 40% canopy closure as the

breakpoint in triggering regeneration harvesting rather than 50%. This is the lowest canopy cover known to maintain successful nesting goshawks.

Even with the loss of this suitable habitat, the remaining amount of suitable habitat, patch size, post-fledging area protection, and limited operating season should enable the analysis area to continue to provide adequate habitat for no less than two pairs of goshawks. These alternatives may impact individuals, but would not trend the species towards federal listing. Individuals may be impacted primarily by a change in the areas that they forage, or have alternate nests, but should have adequate alternate habitat to maintain viability.

Cumulative Effects: Cumulative effects would be the same as those described for the Lakeface-Granite area (No-Action Alternative), and specifically for the Quartz-Jasper general effects.

Alternative E

Direct and Indirect Effects: Alternative E would have similar effects to Alternative A, because there are no habitat changes from the effects of the beetles. Potential disturbance effects would remain, but would be managed under a limited operating season.

Effects of Opportunities

There are no anticipated effects on goshawks as a result of activities identified as opportunities.

Summary of Cumulative Effects for the Priest Lake Project

The following tables provide a summary of the anticipated effects to Sensitive, Management Indicator, and Other Species. The "MI" conclusion ("May impact individuals or habitat but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.") indicates activities or actions that would result in effects that would be immeasurable, minor, or are consistent with the appropriate conservation strategies (USDA Forest Service, 1995). It should be noted that the projected effects of beetle activity (Alternative A) are carried forward through the rest of the alternatives, even if there are no distinguishable effects associated with a particular alternative. A more detailed discussion of effects can be found with narratives of each species earlier in this chapter.

Table III-224. Sensitive Species Conclusion of Effects Summary, Priest Lake Ranger District, Analysis Area Scale.

Species	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Black-backed woodpecker							
Lakeface-Granite	BI	MI	MI	MI	MI	MI	MI
Binarch-Lamb	BI	MI	MI	MI	MI	MI	MI
Upper West Branch	BI	MI	MI	MI	MI	MI	MI
Lower W. Branch	BI	MI	MI	MI	MI	MI	MI
Quartz	BI	MI	MI	MI	MI	MI	MI
Boreal Toad							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI
Quartz	NI	NI	NI	NI	NI	NI	NI
Coeur d'Alene Salamander							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI
Quartz	NI	NI	NI	NI	NI	NI	NI
Common loon							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI
Quartz	NI	NI	NI	NI	NI	NI	NI
Fisher							
Lakeface-Granite	MI	MI	MI	MI	MI	MI	MI
Binarch-Lamb	MI	MI	MI	MI	MI	MI	MI
Upper West Branch	MI	MI	MI	MI	MI	MI	MI
Lower W. Branch	MI	MI	MI	MI	MI	MI	MI
Quartz	MI	MI	MI	MI	MI	MI	MI
Flammulated owl							
Lakeface-Granite	MI	MI	MI	MI	MI	MI	MI
Binarch-Lamb	MI	MI	MI	MI	MI	MI	MI
Upper West Branch	MI	MI	MI	MI	MI	MI	MI
Lower W. Branch	MI	MI	MI	MI	MI	MI	MI
Quartz	MI	MI	MI	MI	MI	MI	MI
Harlequin duck							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI
Quartz	NI	NI	NI	NI	NI	NI	NI
Northern bog lemming							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI
Quartz	NI	NI	NI	NI	NI	NI	NI
Northern Goshawk							
Lakeface-Granite	MI	MI	MI	MI	MI	MI	MI
Binarch-Lamb	MI	MI	MI	MI	MI	MI	MI
Upper West Branch	MI	MI	MI	MI	MI	MI	MI
Lower W. Branch	MI	MI	MI	MI	MI	MI	MI
Quartz	MI	MI	MI	MI	MI	MI	MI
N. leopard frog							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI

Species	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Quartz	NI	NI	NI	NI	NI	NI	NI
Townsend's big-eared bat							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI
Quartz	NI	NI	NI	NI	NI	NI	NI
White-headed woodpecker							
Lakeface-Granite	MI	MI	MI	MI	MI	MI	MI
Binarch-Lamb	MI	MI	MI	MI	MI	MI	MI
Upper West Branch	MI	MI	MI	MI	MI	MI	MI
Lower W. Branch	MI	MI	MI	MI	MI	MI	MI
Quartz	MI	MI	MI	MI	MI	MI	MI
Wolverine							
Lakeface-Granite	NI	NI	NI	NI	NI	NI	NI
Binarch-Lamb	NI	NI	NI	NI	NI	NI	NI
Upper West Branch	NI	NI	NI	NI	NI	NI	NI
Lower W. Branch	NI	NI	NI	NI	NI	NI	NI
Quartz	NI	NI	NI	NI	NI	NI	NI

NI = No Impact
MI = May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.
WI = would impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI = Beneficial Impact

Table III-225. Sensitive Species Conclusion of Effects Summary, Priest Lake Ranger District, Project Area Scale.

Species	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Coeur d'Alene Salamander	NI	NI	NI	NI	NI	NI	NI
Black-backed woodpecker	BI	MI	MI	MI	MI	MI	MI
Harlequin duck	NI	NI	NI	NI	NI	NI	NI
White-headed woodpecker	MI	MI	MI	MI	MI	MI	MI
Boreal toad	NI	NI	NI	NI	NI	NI	NI
Northern goshawk	MI	MI	MI	MI	MI	MI	MI
N. leopard frog	NI	NI	NI	NI	NI	NI	NI
Townsend's big-eared bat	NI	NI	NI	NI	NI	NI	NI
Wolverine	NI	NI	NI	NI	NI	NI	NI
Fisher	MI	MI	MI	MI	MI	MI	MI
N. bog lemming	NI	NI	NI	NI	NI	NI	NI
Flammulated owl	MI	MI	MI	MI	MI	MI	MI
Common loon	NI	NI	NI	NI	NI	NI	NI

NI = No Impact
MI = May impact individuals or habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to the population or species.
WI = would impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI = Beneficial Impact

Table III-226. Management Indicator and other species, Summary of Conclusion of Effects, Priest Lake Ranger District, Analysis Area Scale.

Species	Pileated Woodpecker	American Marten	White-tailed Deer	Moose	Boreal Owl
ALT A					
Lakeface-Granite	MI	MI	NI	NI	NI
Binarch-Lamb	MI	MI	NI	NI	NI
Upper W. Branch	MI	MI	NI	NI	NI
Lower W. Branch	MI	MI	NI	NI	NI
Quartz	MI	MI	NI	NI	NI
ALT B					
Lakeface-Granite	MI	MI	NI	NI	NI
Binarch-Lamb	MI	MI	NI	NI	NI
Upper W. Branch	MI	MI	NI	NI	NI
Lower W. Branch	MI	MI	NI	NI	NI
Quartz	MI	MI	NI	NI	NI
ALT C					
Lakeface-Granite	MI	MI	NI	NI	NI
Binarch-Lamb	MI	MI	NI	NI	NI
Upper W. Branch	MI	MI	NI	NI	NI
Lower W. Branch	MI	MI	NI	NI	NI
Quartz	MI	MI	NI	NI	NI
ALT D					
Lakeface-Granite	MI	MI	NI	NI	NI
Binarch-Lamb	MI	MI	NI	NI	NI
Upper W. Branch	MI	MI	NI	NI	NI
Lower W. Branch	MI	MI	NI	NI	NI
Quartz	MI	MI	NI	NI	NI
ALT E					
Lakeface-Granite	MI	MI	NI	NI	NI
Binarch-Lamb	MI	MI	NI	NI	NI
Upper W. Branch	MI	MI	NI	NI	NI
Lower W. Branch	MI	MI	NI	NI	NI
Quartz	MI	MI	NI	NI	NI
ALT F					
Lakeface-Granite	MI	MI	NI	NI	NI
Binarch-Lamb	MI	MI	NI	NI	NI
Upper W. Branch	MI	MI	NI	NI	NI
Lower W. Branch	MI	MI	NI	NI	NI
Quartz	MI	MI	NI	NI	NI
ALT G					
Lakeface-Granite	MI	MI	NI	NI	NI
Binarch-Lamb	MI	MI	NI	NI	NI
Upper W. Branch	MI	MI	NI	NI	NI
Lower W. Branch	MI	MI	NI	NI	NI
Quartz	MI	MI	NI	NI	NI

NI = No Impact
MI = May impact individuals or habitat, but would not likely contribute to a trend towards Federal listing or loss of viability to the population or species.
WI = would impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI = Beneficial Impact

Table III-227. Management Indicator and other species, Summary of Conclusion of Effects, Priest Lake Ranger District, Project Area Scale.

Species	Pileated Woodpecker	American Marten	White-tailed Deer	Moose	Boreal Owl
ALT A	MI	MI	NI	NI	NI
ALT B	MI	MI	NI	NI	NI
ALT C	MI	MI	NI	NI	NI
ALT D	MI	MI	NI	NI	NI
ALT E	MI	MI	NI	NI	NI
ALT F	MI	MI	NI	NI	NI
ALT G	MI	MI	NI	NI	NI

NI = No Impact
MI = May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.
WI = Will impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI = Beneficial Impact

Consistency With the Forest Plan and Other Applicable Regulatory Direction

All alternatives would be consistent with Forest Plan management direction, goals, objectives, standards and guidelines for the management and protection of wildlife habitat and species.

RECREATION

REGULATORY FRAMEWORK

Recreation goals and objectives as identified in the Forest Plan (sections II-3 (A) and (B)) are to provide for the projected use of developed recreation areas with development of new sites as budget becomes available, to provide for a variety of dispersed recreation opportunities, to pursue opportunities to increase and improve the recreation trail system, and to continue and increase cooperative trail programs with organizations, clubs and other public agencies.

The following excerpts are from the Forest Plan for the Idaho Panhandle National Forests:

- *Recreation Standard 1: Continue to provide a share of recreation opportunities.*
- *Recreation Standard 7: Provide a broad spectrum of dispersed and developed recreation opportunities.*
- *Recreation Standard 8: Treat and maintain timber stands in a manner compatible with recreation objectives.*
- *Recreation Standard 10: Trails will be managed in accordance with management area requirements.*

Determination of the existing conditions for recreation activities, facilities and opportunities is derived from facility inventories, facility maintenance work, observation by recreation specialists and technical personnel and contact with recreation user groups and individuals. Guidance for management of recreation resources is provided in various National Forest manuals and handbooks as well as professional publications and documents.

AFFECTED ENVIRONMENT

Methodology

The goal of recreation management in a wildland location is to provide a variety of settings that allow a diversity of outdoor recreation opportunities for visitors. Recreation opportunities includes a combination of activities, settings and facilities which to some extent predict the probable experiences a visitor to a given area might have. This arrangement of social benefits is called the Recreation Opportunity Spectrum (Forest Service Handbook 86). The Recreation Opportunity Spectrum (ROS) concept provides a framework which allows administrators to manage for and users enjoy a variety of outdoor environments. The ROS is not a land classification system; it is a method of describing and providing a mix of recreation opportunities.

Another way to characterize and evaluate recreation conditions is defined in the Geographic Assessment (draft) for the Priest River subbasin. This concept refers to how people define ecosystems and specific locations in the landscape based on their meanings and images; defined as "sense of place". Examples of places found in the Coeur d' Alene basin are lakes and streams, (water corridors), back-country, high mountain, wildland areas close to urbanized zones or interface and general forest landscapes.

Finally, access to wildlands for the purposes of recreation experience can be quantified and classified by method of access.

Characterization

As reported in the Columbia Basin Assessment, nearly 500 small rural communities of 10,000 people or less can be found in the Columbia River Basin. North Idaho and eastern Washington are becoming destinations, rather than stops along the way. People living in Spokane County, the most populated county in the Columbia River Basin, use all areas of the IPNFs as major destinations for outdoor recreation. The Priest

Lake area is very popular for recreation during all seasons and also has a large number of vacation residences along and near Priest Lake and Priest River.

Current recreation activities within the project area include fishing, camping, berry picking, visiting historic sites, firewood gathering and upland bird and big game hunting. The area is visited by local residents , recreationists from nearby urban areas, and vacationers and retirees travelling through the area. Winter activities include snowmobiling and cross country skiing. The road systems are used to enjoy the scenery, visit historic sites, and participate in the above activities. The dispersed campsites have developed primarily for camping, big game hunting and fishing activities.

Existing Conditions

The goal of recreation management in a wildland locale is to provide a variety of settings that allow a diversity of outdoor recreation opportunities for visitors. Recreation opportunities include a combination of activities, settings and facilities which to an extent predict the probable experience a visitor to a given area might have. This arrangement of social benefits is called the Recreation Opportunity Spectrum, (ROS). The ROS concept provides a framework which allows administrators to manage for and users to enjoy, a variety of outdoor environments. The ROS is not a land classification system - it is a method of describing and providing a mix of recreation opportunities. The ROS has been divided into six major classes for Forest Service use: Urban, Rural, Roaded Natural, Roaded Modified, Semi-Primitive Motorized, Semi-Primitive Non-Motorized and Primitive.

The existing recreation opportunities in the Priest Lake project area are classified as: Roaded Natural and Roaded Modified.

Lakeface-Granite Area

This area provides a scenic backdrop for the upper stretches of the Big Priest Lake. Distillery Bay, which is at the lower edge of the project area, provides miles of dispersed recreation accessed only by boat. Bottle Bay campground is located on the edge of the project area. It is an 8-unit campground that has approximately 4,000 visitor days per season (May to September). Most use at the site occurs from mid-June to Labor Day. Occupancy averages 60% during this period.

In addition to the campsites, the Lakeshore Trail #294 winds for 7.6 miles along the lake shore. Approximately five miles of it are located in the project area.

Other National Forest recreation resources in the area lie away from the lake shore. Two additional trails lie along the edge of the project area. Trail #292, Blacktail Mountain, is 3.5 miles long and is maintained as a fire access trail. Last known maintenance was in 1992-1993. Trail #324, North Blacktail, is 3 miles long and is also maintained as a fire access trail. They are both non-motorized.

During the winter season when snow has closed the roads to wheeled-traffic, there are several trailheads and roads important to the snowmobile program. They include Roads 638, 1347, 1340, and 2512. One snowmobile trailhead is located at the end of the plowed road on Forest road 302 and the other is at the end of the plowed road on Forest road 2512. There are a total of 20 miles of snowmobile trails in the area. Of the three snowmobile routes through the area, the route along the lake shore is most popular (Forest road 2512). The second most used snowmobile route is over Tango (Forest road 638), with Tango Loop (Forest roads 1347 and 1340) the least used of the three.

There is a great deal of day use recreation occurring in the Tango drainage and associated tributaries. This area is used as an overflow dispersed camping area when the Reeder Bay and Beaver Creek Campgrounds are full. There are two dispersed recreation sites located on spur roads of Road 638 along Tango Creek.

Common recreation activities occurring in the area include ATV use on old roads, hiking, picnicking, target shooting and forest product gathering.

There is no recreational fishing opportunity within the area due to closures of all fish-holding streams by the State of Idaho Fish and Game Department to protect spawning of wild trout. The most common fish taken in the lake include west slope cutthroat trout, rainbow trout, crappie and yellow perch.

Binarch-Lamb Area

Bismark mountain is the backdrop for much of the view from Highway 57 as you leave the village of Lamb Creek.

There are a variety of recreation facilities in the area. Trails include the North Lamb Trail (204), 5 miles in length and open to non-motorized uses only. This trail has been maintained as a fire access trail, and is in poor shape. Other trails are the Hanna Cutoff (232), which is 1 mile long and maintained as fire access trail. The Bath Creek Trail (234), which is 3.5 miles and maintained as a fire access trail.

In the winter season the Bismark Mountain area becomes the gateway for snowmobile riders. Nordman has become one of the most popular trail heads at Priest Lake. Snowmobile trails in the analysis area include Forest roads 313 and 1351 for a total of four miles of trail. They are also among the most heavily used trails on the ranger district.

A cross country ski area is located on Highway 57 at the east side of the project area. The trails follow old roads marked with route markers and signed at junctions. This trail system is connected to the Hill's Resort and Golf Course Nordic system by a system of roads near the Kalispel Road. The Priest Lake Ranger District and Hill's Resort provide snow grooming services.

Other recreation in the Binarch-Lamb area includes limited recreational fishing in small streams.

Off-road motor vehicle use is also a large and growing activity in the area, indicative and typical for the urban interface front. Jeeps and all terrain vehicles are using old roads, fire lines and logging trails throughout the area. This activity is largely unregulated, due to limited funding in the ranger district's recreation budget.

This area is south of the main recreation activities occurring around Priest Lake. Binarch is popular with dispersed campers and is the main snowmobile route around the south end of the lake. There are also two undeveloped (dispersed) camping sites next to Binarch Creek and the Lower Priest River at the east end of the project area. The largest of the two sites is located on the east side of Highway 57. Boaters and kayakers launch from this area to access Binarch Rapids. On the west side of Highway 57, on Road 639 there is a conglomerate of several dispersed campsites, all located within 100 feet of Binarch Creek and Highway 57.

Trails in the Binarch Project area include the Binarch Creek Trail #220, which is 6.5 miles long and maintained for hiking and motorized trail use. This trail was originally constructed as a road, but was converted in the early 70s to a single-track trail. It is popular with motorized user groups. There is a major trail head located at the Priest Lake Information Station at the Dickensheet Junction.

In addition to summer trail use, 18 miles of road become the route for the groomed snowmobile system, including Roads 312 and 219. This is the main access route around the south end of the lake, because there is no place for a route beside Highway 57 from Outlet to Dickensheet Junction.

Fishing is popular in the lower stretches of Binarch Creek.

Upper West Branch Area

There is one developed recreation site located at Pelke Pass, built and maintained by the Spokane Winter Knights snowmobiling group. It is a winter warming hut, built at the pass between the Newport and Priest Lake Districts, located off Road 659 on a the gated spur Road 460A. It is a 20-foot x 30-foot log building, and is open to all winter sports enthusiast. There are several backcountry trails located in the project area, including the trail head for Icy Springs (#197) and Grouse Knob, which is two miles long and maintained as a fire access trail.

The groomed snowmobile trails include Roads 659, 1080, 333, 1040, and 1137. These are groomed by Pend Oreille County snowmobile program, since they are located in Washington state.

Fishing for brook trout in the West Branch of Priest River is popular. The area has two active guide services, which provide opportunities for skiing, hiking, horse packing, and snowmobile trips.

Tola Area

Within the Tola area, there is one developed recreation site, the Priest Lake Information Station, located at the Dickensheet Junction . It is located at the southeast end of the project area, and is not directly within the bounds of the project. There are no known dispersed recreation sites within the project area.

Roads 312 and 219 form the connecting snowmobile trail that goes over the pass to the state of Washington system. About two miles of the trail is within the analysis area at the northern end of the project area.

Lower West Branch Area

There is one developed location at the South Baldy Lookout, which is staffed in the summer by volunteers. There are also several dispersed campsites located on Roads 306 and 1137, which surround the South Baldy Lookout. Trails in the area include Trail 104, which starts at South Baldy and goes to Mill Creek point. It is approximately 3 miles long and was last maintained by the fire crew in 1989.

The groomed snowmobile route runs up Road 333-305. This route goes up and over to the Newport Ranger District, down to Skookum Lake. The area has two active guide services, which provide opportunities for skiing, hiking, horse packing, and snowmobile trips.

There are two popular dispersed recreation sites located in the project area. The first site is located on Road 1084 next to Bear Paw Creek. The other is on the Bear Paw Divide on Road 3318. Both are popular for hunters, fishers, and huckleberry pickers.

An old trail runs along the western edge of the project area, which is also the divide between the Newport District and the Priest District. This trail, #183 or Divide Trail, has been of interest to the Backcountry Horsemen for years. This trail was last maintained in 1987 by the fire crew.

Moores Area

There are no known dispersed camping areas in the Moores area. All of the trails in the project area have previously been constructed into roads. The area is primarily known for the brook trout fishery in Moores Creek. It is also popular for mule deer, white-tailed deer, elk and bear hunting.

There are no groomed snowmobile trails in the Moores Creek area.

Quartz Area

There is a semi-developed trail head located on Road 334. It is the access for the Pee Wee-Steep Creek trail system, which is 17 miles of interconnected loops, developed for horseback riding and motorcycle use. The trail is maintained regularly by the Back Country Horsemen and the ranger district trail crew. The largest larch tree in Idaho is located along the western edge of the project area and can be accessed via the Johnson Road .

The project area has a dozen dispersed campsites located on the Priest River, and Road numbers 334, 1314, 1355, 1300. The eastern edge of the project area is a stretch of the Priest River popular to fishermen and floaters (canoeists, kayakers, tube-floaters). Hunting is popular within the Quartz area for white-tailed deer, mule deer, elk and black bear.

ENVIRONMENTAL CONSEQUENCES

Methodology

The effects to recreation resources can seldom be measured quantitatively. Often qualitative judgements of the effects must be made. Many of the effects of the alternatives on the recreation resources were based on observations, training, personal contact with recreation user groups, research regarding visitor attitudes and expectations, as well as the use of best professional judgement by the District Recreation Specialist and the Interdisciplinary Team.

It is possible to measure effects more quantitatively on the following items:

- *Temporary or long term impact to developed recreation sites.*
- *Effects on District trails.*
- *Effect on District snowmobile trail system.*

Direct, Indirect and Cumulative Effects at the Priest Lake Ranger District Project Area Scale

In all action alternatives the ROS would be unchanged. Within all areas a number of roads exist, ranging from those usable by automobile to many that are partially or totally closed by brush or constructed barriers. There are numerous timber harvest units varying in age from a few years old to several decades. Logging units range from partial cut sites where scattered stumps are the only evidence of timber harvest to clear cuts. Clearcut units range from this which are well regenerated with immature trees to those still dominated by brushy vegetation. Ample opportunity would remain to enjoy outdoor recreation activities in a partially human-modified environment that still contains a high degree of naturalness.

Many miles of roads would remain open to normal vehicle travel. Access via roads would be maintained to all developed recreation sites and National Forest system trails.

The Goose Creek (road 333) and Consolus Creek (road 1108) would be obliterated under all action alternatives except alternative F (private land protection). This action would affect the availability of these roads for snowmobile grooming by the State of Washington. The Washington State groomed system would be reduced by approximately 11 miles with this action.

There may be temporary interruption of recreational road travel within some portions of areas do to logging operations or other management activities. Generally this is would be a short term disruption of less than two months.

Winter recreation travel routes would be affected by plowing when the purchaser chooses to winter log. Snowplowing to access winter logging sites would temporarily reduce the amount of groomed snowmobile trails in Lakeface-Granite by approximately 13 miles of the 35 miles available. In the Upper West Branch project area, 11 miles would be permanently removed by the obliteration of the 333 and the 1108. There are 43 miles available in the Upper West Branch. There are no groomed snowmobile routes in Lower West Branch and Quartz.

All-terrain vehicle travel opportunities would continue to be available on old road systems.

There are no restrictions on recreationists entering National Forest lands in any of the areas, with the exception of possible short term restrictions in active timber harvest areas for the purposes of public safety. The only area where units are directly adjacent to a trail is on the Pee Wee-Steep Creek Trails system, which would be temporarily closed during helicopter logging operations. No roadless areas greater than one thousand acres would be entered or created by any action alternative activities.

Dust, smoke from prescribed fires, equipment and machinery noise including helicopter operations would be possible temporary conditions in all action alternatives. Recreation activity in dispersed camping areas and along trails will likely be reduced due to these logging activities.

Hunting opportunities would be maintained with access by road and off-road travel.

Under all alternatives, recreational fishing would be maintained and largely unaffected.

The opportunities for recreational gathering of forest products, (berry, mushroom picking, etc.) would be retained. Some road access to various areas may be temporarily interrupted and some road access may be altered by road rehabilitation actions.

Alternative A

Alternative A is the no action alternative. Selection of this alternative would not affect developed recreation facilities and would not affect the ROS class in the areas. In areas where beetle-killed trees surround recreation trails, there would be a higher cost for maintenance as more than a normal amount of deadfall would occur on trails for several years.

Dispersed recreation may be effected with impaired access on travel routes due to blow down or erosion problems.

The beetle attacks would result in openings in the timber cover. These openings would be difficult to travel through by any means, with the downed trees limiting recreation access.

The danger of possibly larger wildfires due to elevated fuel conditions could threaten recreation facilities and opportunities throughout the Priest Lake Ranger District.

Recreational fisheries would be unaffected, unless a large wildfire were to occur.

Alternative B

Lakeface-Granite - There would be no direct effects to Trail #294 Lakeshore, Trail #292 Blacktail Mountain, or Trail #324 North Blacktail. Use of these trails may be temporarily interrupted by harvest activities, such as the use of helicopters and trucks on haul routes.

Due to the requirement to winter log in the Lakeface-Granite project area, there would be an effect to the groomed snowmobile route. Plowing for winter logging access may include Forest roads 638, 1347, 1340 and

2512. One snowmobile trailhead is located at the end of the plowed Road #302 and the other is at the end of the plowed road on Forest road 2512. Existing trailheads for snowmobile access would remain available, although with winter logging one of these routes would be interrupted. There are a total of 20 miles of snowmobile trails in the area. Of the three snowmobile routes through the area, Forest road 2512 along the lake shore is the most popular. The second most used snowmobile route is over Tango road 638, with Tango Loop road 1347; Forest road 1340 is the least used of the three.

Additional road obliteration may effect common recreation activities occurring in the area including, ATV use on old roads, hiking, picnicking, target shooting and forest product gathering. Recreation access may be improved in some instances where heavy or light reconstruction is being done. This would be the case in the light reconstruction of Forest road 638.

Forest roads 2249 and 2249A are dead end roads that are currently restricted to recreation access. They would have level 1 obliteration done in Alternative B. This area could still be accessed by Forest road 1347.

The road 2245 network is considered newly restricted access under all alternatives, which may effect dispersed activities like huckleberry picking and hunting in this area. The roads proposed for closure are a series of short dead end spurs. The portion of this road system that accesses private land would remain open, also allowing recreation access to part of the area. How these restrictions would effect recreation access is difficult to predict is this case given the proximity to the Granite Creek population center and the private land access.

Forest road 1347 currently has restricted access and it would have level 1 obliteration under all action alternatives. It is not brushed in at this time, but with the pulling of culverts is would brush in rapidly, reducing the walk-in recreation access. This area is also adjacent to private land, but more remote than Forest road 2245.

Forest road 1340 currently has restricted access and is brushed in. Level 1 obliteration would likely have little effect on the recreation access to this area. There are no other recreation access points to this area, but you could still drive Forest road 638 over Granite mountain.

Binarch-Lamb - There would be no direct effects to summer recreation trails in the area which includes the North Lamb Trail #204, the Hanna Cutoff Trail #232, and Bath Creek Trail #234. Use of these trails may be temporarily interrupted by harvest activities, such as the use of helicopters and trucks on haul routes.

In the winter season the Bismark Mountain area becomes a gateway for snowmobile riders. Snowmobile traffic in the analysis area will be interrupted by plowing on Forest roads 313 and 1351 for a total of four miles of trail. This would result in a temporary disruption of north-south traffic and reduce the availability of the total amount of trails available in a season. These are some of the most heavily used snowmobile trails in the area.

There would be no effect to the cross country ski area located at Hanna Flats. There would be no effect to recreational fishing within the area.

Alternative B would have no effect on the dispersed camping sites located next to Binarch Creek and the Lower Priest River at the east end of the project area. It would also have no effect on the dispersed sites on the west side of State Highway 57.

There would be no effect on trails in the area, which includes the Binarch Creek Trail #220. Use of these trails may be temporarily interrupted by harvest activities, such as the use of helicopter decking areas and trucks on haul routes.

If logging occurred in the winter in the Binarch area, 18 miles of the route for the groomed snowmobile system may be effected, including Forest roads 312 and 219. This is the main access route around the south end of the lake because there are no other routes available along State Highway 57 from Outlet to Dickensheet Junction.

Recreation access for such dispersed activities as huckleberry picking and hunting would be reduced with the closure of Forest road 313E. This closure is listed as newly restricted access. Road 313E is a dead end road which has already been partially obliterated. In alternative B, the obliteration could be completed after timber sale activity. The area could still be accessed from road 313F for recreation purposes, so effects to recreation would be minor.

Forest road 310E is a newly restricted access, but road 310C is also available to access this same area. Effects to recreation would likely be minor.

Road 639 (unlabeled spur accessing bn19) is a non-system road that is not currently drivable as a recreation access. The Level 1 obliteration of this road should not effect recreation access.

Upper West Branch - If the purchaser chooses to winter log within the Tola area, two miles of groomed snowmobile trail may be effected by plowing Roads 312 and 219. There would be no effects to the Visitor Information Station located at the Dickensheet Junction.

If winter logging occurs, the snowmobile route over Pelke pass may be plowed, affecting the east-west snowmobile traffic and access to the Pelke Pass Winter Warming hut. The groomed snowmobile trails include roads 659, 1080, 333, 1040, and 1137. These are groomed by a Pend Oreille County snowmobile program, as they are located in Washington State.

There would be no effect on the trail head for Icy Springs Trail #197 and Grouse Knob.

There would be no effect on South Baldy Lookout. There would be no effect on the dispersed campsite located on roads 306 and 1137 which surrounds the South Baldy lookout. There would be no effect on the trails in the Flat Goose area which includes the Divide Trail # 104, which starts at South Baldy and goes to Mill Creek point. If winter logging occurs, the groomed snowmobile route which runs up roads 333 and 305 may be effected by plowing.

Recreation access for such dispersed activities as huckleberry picking and hunting would be reduced with the closure of road 1108 accessing the Consalus Creek drainage. This road would no longer serve as a through route to other areas of the district. Road 333B also accesses Consalus Creek drainage, but it would remained earth bermed after the sale. Road 333B would be lightly reconstructed under alternative B and is currently earth bermed.

Road 333 Goose Creek would be obliterated under alternative B. This would affect recreation access in the summer on the south facing aspects of Goose Creek. There would still be a through route on road 2730.

An additional closures that would be newly restricted access is road 1308F, which is a dead end spur road and is currently drivable. There is an alternative access route on road 1308E to access this area. The 1308A road would also be newly restricted access, but is not currently drivable. The main 1308 road winds around the area accessed by the A spur. These closures would have an undetermined effect or recreation because use of this area is unknown.

Lower West Branch - There would be no effect to the dispersed recreation sites located on road 1084 next to Bear Paw Creek or on the Bear Paw Divide spur road off road 3318. There may be effects to the Divide Trail.

Recreation access for such dispersed activities as huckleberry picking and hunting may be slightly reduced by the level 1 obliteration of roads 462B, 462C, 462D, 462E, 1906A, 2291A and 2250A. These are all dead end spur roads with alternative access into the drainages they are in. They are all currently closed to driving access and would remain so under alternative B.

Roads 1092 and 1332F are listed as new restricted access due to level 1 obliteration. The 1092L area can be accessed by road 1092M, and proposed obliteration would not significantly reduce recreation use. Road 1332F is currently brushed in and was not significantly used for recreation

The heavy reconstruction of road 1142 that follows Butch Creek and over Ojibway Knoll would improve recreation access to this area. Road 318 would be lightly reconstructed, and would be an improvement for the high amount of recreation traffic that travels this route. Light reconstruction on road 1095 would improve access to the West Fork of Moores Creek.

Quartz Area - Proposed units 4, 6, 7, 20 and 28 are within or located near the Pee Wee-Steep Creek trail system. The prescriptions in these units would likely enhance the views from the trail. The trail would be protected according to the design criteria. Because proposed harvest units 4, 6, 7 and 28 have prescribed helicopter logging, there would be little likelihood of creating other trails where motorcycle use may become established. Logging unit 20 would require the reopening of Road 1314D. During the logging of these units, use on this trail would be restricted. This would have a temporary effect on recreation use in the area. There would be no effect to the Pee Wee-Steep Creek trail head or the trail to Idaho's largest larch tree. There would be no effect to the dispersed campsites located on the Priest River.

The relocation and resurfacing for erosion control on road 416 would improve recreation access to the Quartz and Steep creek drainages. This would improve access to the trail head for trail #177 and #178, the Pee Wee-Steep creek trail system.

Alternative C

The direct and indirect effects of this alternative would be the same as those outlined in Alternative B.

Alternative D

Additional harvest activity in Alternative D would have additional effects on the recreation due to the longer duration of truck traffic on haul routes.

Road 1092Q is listed as new restricted access due to level 1 obliteration. The 1092Q road is currently brushed in and was not significantly used for recreation in the past.

Bismark - Two harvest units would directly affect the North Lamb Trail #204. Also, a longer portion of the groomed snowmobile trail would be affected.

Alternative E

The effects of this Alternative would be the same as Alternative B.

Alternative F

Interruption in recreation activities and opportunities would be slightly less in duration than that of other timber harvest alternatives (B, C, D and E).

The reduced amount of harvest units would also reduce the opportunities for road reconstruction. In alternative F, reconstruction of such forest roads as 1142, 1075 and 318 would not be done. These roads

would remain in a rough condition, keeping recreation access difficult. Conversely, Consalus creek road 1108 would not be level 2 obliterated, maintaining recreation access to this area.

Alternative G

Prescribed burning proposed in this alternative would have similar effects as that proposed in Alternative F. This Alternative would close more non-system roads by culvert removal and obliteration of roads where they intersect with main collector roads. The direct and indirect effects would be similar to other action alternatives but without timber harvest activities and the temporary disruptions anticipated. The ROS condition of roaded and natural appearing would be retained but there would be fewer old roads in the project areas that would have drainage structures intact.

Cumulative Effects

In all action alternatives, the possibility of increasing use of the areas by All-Terrain-Vehicles (ATV) exists. ATV use has greatly increased on the Priest Lake Ranger District in the past decade. The pattern of ATV use has included utilization of logging roads, skid trails and firelines. New developments of this kind may be used by ATV's and possibly larger sport utility vehicles.

There is a possibility of reducing the availability of ATV miles in the analysis areas through the proposed actions of road rehabilitation which would remove drainage structures, and partially obliterate short segments of roads. Road rehabilitations proposed would inhibit access and use of old roads by ATV's.

The opportunity to enjoy recreational activities in a roaded but natural appearing wildland setting would be retained under any alternative.

Various operational activities within the areas would temporarily displace some recreation activities into other parts of the Priest Lake Ranger District or other wildland areas where outdoor recreation is permitted. Disruption of the groomed snowmobile route may result in some displacement of snowmobilers to the east side of the lake, or displace them out of the basin. The amount of displacement will depend on the amount of disruption to the system by winter logging.

Effects of the Opportunities

Recreation restoration projects such as the reconstruction or construction of dispersed recreation sites will only occur when dispersed sites are destroyed or made inaccessible by road obliteration or use as a landing. Timing of harvest activities may temporarily affect access to groomed snowmobile trails, and would necessitate information dispersal on the closure and signing.

Consistency with the Forest Plan

Recreation Standard 1: Continue to provide a share of recreation opportunities.
This standard shall be met under all alternatives.

Recreation Standard 7: Provide a broad spectrum of dispersed and developed recreation opportunities.
This standard will be met with all alternatives.

Recreation Standard 8: Treat and maintain timber stands in a manner compatible with recreation objectives: Current recreation objectives within these areas will be maintained. Potential for future recreation developments and programs will be affected.

Recreation Standard 10: Trails will be managed in accordance with management area requirements: In action alternatives, standards will be met for trails.

SCENERY

REGULATORY FRAMEWORK

The Multiple-use Sustained Yield Act of 1960 provides the underlying direction that scenery is a use for which the National Forests must manage. Management direction for the scenic resource is provided by the Idaho Panhandle National Forests Land and Resource Management Plan (USDA 1987). Additional information and descriptions regarding Visual Quality Objectives (VQOs) and Scenic Quality Objectives may be found in the Forest Service Scenery Management System and Visual Management System, National Forest Landscape Management handbooks. The Forest Service adopted a new scenery management system in 1996, after the Forest Plan was signed. This system is outlined in "Landscape Aesthetics - a Handbook for Scenery Management". Full application of this new scenery management direction will happen concurrently with the revision of Forest Plans.

The following excerpts from the Forest Plan address management of visual resources:

> *The Idaho Panhandle National Forests will continue to be a place dominated by natural beauty - its lakes, rivers plains, and mountains. The visual character of some of the areas's forest will change to a more varied landscape as forest harvest works toward a balanced age class distribution*
>
> *Manage the visual resource by maintaining the visual quality objectives.*
>
> *Manage to emphasize the uniqueness of the visual quality, water quality, wildlife, fisheries and recreation around Hayden, Priest, Pend Oreille and Coeur d'Alene Lakes.*
>
> *Meet adopted visual quality objectives. Exceptions may occur in unusual situations; these will be identified through the project planning process involving an ID team. Examples of some exceptions are: areas where past management practices make it impractical to meet the adopted visual quality objectives (VQOs), and large areas where the mortality rate for timber is very high. Mitigation measures should be developed for areas when VQO's are not met.*
>
> *The visual resource has been evaluated based on visual sensitivity levels assigned to travel routes, use areas, and water bodies in and adjacent to the IPNF. Adjustments in VQO boundaries based on project level analysis will conform with principles in FSM 2380.*
>
> *Meet visual quality objectives in all management areas*
>
> *The objectives of landscape management will be to manage the Forest lands so as to attain high visual quality commensurate with other resources by meeting or exceeding the adopted visual quality objectives. Visual resource management is an integral activity in each management area and is implied in all management goals. The adopted visual quality objectives are based on the seen areas from the adopted visual sensitivity levels assigned to travel routes, use areas, and bodies of water in and adjacent to the Idaho Panhandle National Forests. A list and map of the assigned sensitivity levels is contained in Appendix D. Public awareness and knowledge of Forest Service landscape management and the visual management system will be enhanced through public information programs. This program will include the general public and special interest groups. Special emphasis will be placed on maintaining the uniqueness of the visual resources around the major lakes."*

The Forest Plan identified areas with special sensitivity levels. Sensitivity levels are a measure of peoples' concerns for the scenic quality of the National Forest. Sensitivity levels determined for land areas viewed by those who are traveling through the forest on developed roads and trails; using areas such as campgrounds and visitor centers; or recreating at lakes, streams and other water bodies. There are three sensitivity levels for identifying the different levels of concern a visitor/user has for the visual scenery quality they experience. These sensitivity levels were used to develop the management areas in the Forest Plan.

Level I - Highest Sensitivity. Sensitivity Level I areas include Highway 57, Hanna Flats and Priest Lake. From all three areas, the planning area is viewed as foreground, middleground and background. Some views are of long duration; from Priest Lake, views are of very long duration.
Level II Average/Moderate Sensitivity. Level II areas include East Side Priest River road, East Shore Priest Lake road and Priest River. From all three areas, the planning area is viewed as foreground, middleground and background. Some views are of long duration.
Level III - Lowest Sensitivity. All other areas are Level III.

Binarch RNA - VQO (Preservation) - The VQO was set before the IPNFs 1987 Forest Plan was approved. The RNA was established with the Forest Plan and the Establishment Record was developed. The site-specific boundaries were set in the Establishment Record. The upper limit of the RNA is 3,200 feet elevation as documented in the Establishment Record. The VQO was not a site-specific delineation due to the variability of the landscape. Consequently, the VQO of Preservation does not match the Establishment Record. The VQO of Preservation should end at the 3,200 foot elevation contour and not extend to the ridge top as the VQO map delineates. This change should be noted for any updates to the VQO map. There would be no effect to the RNA from this project.

Quartz - There should be a change noted to the VQO map in Section 6, T. 57 N., R. 4 W. An update is necessary for the VQO map.

AFFECTED ENVIRONMENT

Characterization

Landscape Character

Every landscape changes over time; in turn, the landscape character continues to change, whether it is actively managed or allowed to naturally evolve. In the Douglas-fir Beetle Project Area, there has been a change in historic vegetation species and vegetative patterns. The resulting patterns are becoming less sustainable over the long term due to high risk of fire and insect infestations.

The majority of the planning area is viewed from many locations and is perceived as having a somewhat natural appearing landscape character. Landscape character gives a geographic area its visual and cultural image, and consists of the combination of physical, biological and cultural attributes that make each landscape identifiable or unique. A "natural appearing" landscape is a landscape character that has resulted from human activities, yet appears natural, such as historic conversion of native forests into farmlands or pastures that have reverted to forests through reforestation or natural regeneration.

It is typical that most users of the area and people residing and working in the area value the National Forests for their economic stability and at the same time desire that management activities occur in such a manner that the scenic value of the area is not degraded.

Scenic Values and Sense of Place

The "sense of place" for the area includes accessible opportunities for viewing scenery, gathering miscellaneous forest products, viewing of wildlife, hunting, and summer and winter recreational activities. All of these things are important as well as the knowledge that the forests are also being properly managed to provide for multiple-use benefits, including jobs in the forest products industry and other special uses. The concept of "Sense of Place" focuses on the subjective and often shared experience or attachment to the landscape emotionally or symbolically. It refers to the perception people have for a physical area with which they interact, whether for a few minutes or for a lifetime. It gives the specific area special meaning to them, to their community or to their culture. The categories for this planning area include the following:

Backcountry - valued for undeveloped characteristics, the backcountry is open to all recreation uses. The scenic value is high. Douglas-fir Beetle Planning Areas with lands in this category include Upper West Branch and Quartz.

Wildlands - include high mountains and high mountain meadows, rocky summits and timberline. Wildlands are valued for their natural environment. Trail-based recreation predominates. The scenic value is very high. No Douglas-fir Beetle Priority Areas contain wildlands.

Scenic Corridor - valued for long-range vistas. The scenic value is very high. Douglas-fir Beetle Planning Areas with lands in this category include Lake Face Granite, Binarch-Lamb and Upper West Branch.

Timberland - supports the widest range of activity that is independent of landscape aesthetics. The scenic value is low. Douglas-fir Beetle Planning Areas with lands in this category include Binarch-Lamb, Upper West Branch and Lower West Branch.

Water Bodies and Corridors - include lakes, rivers, streams. The focus is on water based activities. The scenic value is high to moderate. Douglas-fir Beetle Planning Areas with features in this category include Lake Face Granite, Binarch-Lamb and Quartz (Watson, Bismark, Binarch and Quartz Jasper treatment areas).

Existing Landscape Character

Variety class refers to the degree of diversity in a character type. Variety classes are obtained by classifying the landscapes into different degrees of variety. This determines those landscapes which are most important and those which are of lesser value from the standpoint of scenic quality. The classification is based on the fact that all landscapes have value and those with the most variety and diversity have the greatest potential for high scenic value. There are three variety classes used to identify the scenic quality of the landscape. Class A - Distinctive, Class B - Common or typical, and Class C - Minimal.

Variety Class B best describes the overall scenic quality of the Priest Lake Planning area. There are, however; Class A areas included in the planning area.

Scenic integrity refers to the degree of intactness and wholeness of the landscape character. Human alterations can sometimes raise or maintain integrity. More often it is lowered depending on the degree of deviation from the character valued for its aesthetic appeal. Scenic Integrity is divided into six classifications. The classifications are Very High (unaltered), High (appears unaltered), Moderate (slightly altered), Low (moderately altered), Very Low (heavily altered), and Unacceptably Low (extremely altered).

The Priest Lake planning area, due to mixed ownership, meets all levels of scenic integrity as described above. For example, past harvest activities are evident on State and private industry timber lands, private land, and National Forest lands. In particular, old clearcut units typically had straight line edges and often were larger than natural appearing openings, visible nearby. These old harvest units have a Very Low or Unacceptably Low scenic integrity level - landscapes appear heavily or extremely altered, deviations strongly or extremely dominate the valued landscape character, they borrow little if any form, line, color, texture, pattern or scale from the landscape character. There are areas on the Priest Lake District like Bath Creek Gorge, Hanna Flats, Watson Mountain and Copper Butte with a High or Very High scenic integrity - landscapes where the valued landscape character is intact and the existing landscape character and sense of place are expressed at the highest possible level. These levels of scenic integrity vary throughout the planning area. While driving, one may view an unacceptably low level and then drive into an area that has a higher level of integrity. The terrain varies from pastoral agricultural farmlands to semi-primitive areas of steep rocky outcrops. The majority of recreationists who visit the National Forests have an image of what

they expect to see; yet, each area has its unique character. The following profiles discuss the existing landscape character of each Douglas-fir Beetle Priority Area from various sensitive viewing areas.

Binarch-Lamb

Binarch - The viewer sees steep terrain, harvest activities with square straight line effects on the hill side, skyline corridors, road cuts, and some natural openings. The area is moderately timber covered. The area appears moderate to heavily altered. It has a low landscape character. It is seen from Highway 57 (long duration views from both north and south), Priest Lake, Hanna Flats, and East Side Priest Lake road

Bismark - The viewer sees steep terrain, harvest activities, road cuts, some natural openings and open meadows with some color variation in the fall. The area is moderately timber covered. The area appears moderately altered. It has a moderate landscape character. It is seen from Highway 57 (long duration views from both north and south), Priest Lake, and East Side Priest Lake road.

Lake Face Granite

Watson - The viewer sees steep, rocky terrain, few harvest activities, and natural openings. The area is mostly timber covered. The area appears slightly altered. It has a high landscape character. It is seen from Highway 57, Road 1339, Priest Lake, and East Side Priest Lake road.

Upper West Branch

Tola - The viewer may only get a small glimpse of timbered area. It has a high landscape character. It is seen from Highway 57 (very little of this area is seen).

Pelke/Galena - The viewer sees steep terrain, harvest activities on both public and private land. The area is moderately timber covered. It has a moderate landscape character. It is seen from Highway 57, Priest River, Priest Lake, and East Side Priest Lake Road.

Lower West Branch

Ojibway/Mosquito - The viewer sees steep terrain, large harvest activities both public and private with rectangular straight line effects on the hill side, road cuts and natural openings. The area is moderately timber covered. The area appears moderate to heavily altered. It has a low landscape character. It is seen from Highway 57 and Priest River.

Flat/Goose - The viewer sees rolling terrain, private harvest activities, and some natural openings. The area is mostly timber covered. The area appears slightly altered. It has a high landscape character. It is seen from Highway 57 (very little of this area is seen).

Moores - The viewer sees flat to rolling terrain, private harvest activities, open meadows, and natural openings. Hardwoods provide some color variation in the fall. The area is mostly timber covered. The area appears slightly altered. It has a high landscape character. It is seen from Highway 57.

Quartz

Quartz/Jasper - The viewer sees steep terrain, few harvest activities both on private and public land, road cuts, many natural fire created openings and dry natural openings on the south slopes. The area is moderately timber covered. The area appears slightly altered. It has a high landscape character. It is seen from Highway 57, Priest River and the East Side road.

ENVIRONMENTAL CONSEQUENCES

Methodology

Timber harvest, road construction and fuels treatments can affect the appearance of a forested landscape due to contrasts created between natural appearing landforms and vegetation and those modified by management activities. These changes are often expressed in artistic terms of form, color, line and texture. Contrasts are created by human-induced changes in vegetative cover and soil disturbances.

The ability to control how management impacts would appear when viewed with an artist's critical eye depends on the silvicultural system employed, logging techniques, terrain orientation to viewers, and logging slash disposal methods and completeness.

The appearance of the priority areas today is quite different from what one may have seen in the early 1900s, before much of the dramatic human influence of logging, cultural activities, settlement development and forest fire control began in earnest. Pre-1900s photographs, written descriptions and dendrological study paint a picture of a forested landscape somewhat different from the existing condition. Instead of today's uniform, thick blanket of trees, the nineteenth century landscape was far more diverse. There were much larger numbers of western white pine, ponderosa pine and western larch in early forests. The overall appearance was of more open stands of timber, larger trees in both height and diameter and greater diversity in color and texture. Uncontrolled fires created a patchwork of openings in the timber, far more than one observes today.

The goal, therefore, of scenery management would be to maintain, generally, the views people now enjoy from the key points of high visual sensitivity previously identified in the existing condition portion of this document. Where there is an opportunity, planting would introduce a tree component that would in a small way help to diversify color and texture in the stand. Small openings created on timbered slopes would be in scale with existing naturally created openings and be irregularly shaped. The employed systems are evaluated as to their effects to visual quality as viewed from key viewpoints. Effects of burning are similarly evaluated.

The methodology in evaluating the effects of the various management proposals for the Areas involve the following premises:

The effects analysis identifies the methods for comparing direct and indirect effects for each alternative, important interactions involved in each alternative, effects common to all action alternatives, direct and indirect effects analysis and cumulative effects analysis.

The methods for comparing the effects of the alternatives are as follows:

1. *Scenic Integrity Levels and Landscape Character estimated for each alternative.*

2. *Acres displayed by Visual Quality Objective (VQO) for Retention and Partial Retention for each alternative.*

3. *The estimated amount of canopy closure below 40% left on the landscape by acres for Retention and Partial Retention VQOs.*

Scenic effects within the Priest Lake planning area are quantified and interpreted based on how activities associated with each of the alternatives change the existing Landscape Character and Scenic Integrity. Landscape Character refers to naturally established landscape patterns that make each landscape identifiable or unique. Scenic Integrity is the state of naturalness or conversely, the state of disturbance created by

human activities or alteration. The frame of reference for measuring Scenic Integrity levels is the valued attributes of the existing Landscape Character being viewed. The degree of scenic altered condition depends on the amount of changes seen from the sensitive viewing points. Altered condition in the landscape would be the greatest when most of the trees are removed in a given unit or area. Consequently, the least change would occur when the existing trees are not removed. The character of the landscape would be least affected when most of the existing trees are left intact. Landscape character changes would occur similarly to the Scenic Integrity. The table below describes the Scenic Integrity rating criteria and Landscape Character associated with each. For this analysis, the focus will be on the vegetative element of Landscape Character.

Table III-228. Ratings of scenic integrity levels and landscape character of vegetation.

Criteria	Very High	High	Moderate	Low	Very Low	Unacceptably Low
Landscape Character VS. Deviation (changes in form, line, color, & texture)	Naturalness is Dominant, texture changes only	Naturalness is Dominant, some color & texture change	Evident, but not Dominant. Color, texture, with some line changes	Unnatural Dominance. Changes in color, texture, line, & form are in scale with area	Unnatural Dominance. Changes in line and form are in scale with landscape	Unnatural Dominance. Color, texture, form and line are out of scale
Degree of Deviation from Landscape Character (Including Mechanical Disturbances)	None	Not evident (Light touch)	Evident, but not dominant (Light to moderate touch)	Dominant (Moderate to heavy touch)	Very dominant (Heavy touch)	Extremely dominant (Extremely heavy touch)
Type of Logging	Helicopter	Helicopter Horse	Skyline Tractor Helicopter	Tractor Skyline	Skyline	Skyline
Intactness of the Landscape Character	Fully expressed	Largely expressed	Moderately expressed	Lowly expressed	Very lowly expressed	Not expressed

Important Interactions

Thinning trees and associated activities of road construction and logging systems can affect the scenic resource by altering the naturally established form, line, color and texture in a given viewing area or viewshed. The Landscape Character of the area and the existing Scenic Integrity level (condition) may be affected. Scenic impacts of the change depend on the interactions of the following:

1. *Access to stands by roads and skid trails.*
2. *Harvest methods and silvicultural systems.*
3. *Slash disposal methods.*
4. *Shape, size, and arrangement of harvest units.*
5. *Topographical relationship to viewers position and duration of view.*
6. *Existing Landscape Character and Scenic Integrity.*
7. *The ability of the viewshed to absorb change.*

Contained in the project file are tables which identify specific units, silvicultural prescriptions, logging systems, acres, road work, percent crown closure and method of fuel treatment for Retention and Partial Retention for each action alternative.

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

Effects Common to All Action Alternatives

Trees will continue to die from beetle attacks and other causes. Some of these dead trees will continue to remain on the landscape. The No-Action Alternative acres that are not treated will occur in each action alternative. Natural openings will be created. The size will depend on the number of trees which die. Red crowns may be visible in all alternatives. The risk of large wildfires, which remove large patches of trees from the landscape, will remain a possibility with all alternatives.

Comparison of Effects Between Alternatives

Table III-229. Scenic integrity and landscape character by alternative, Priest Lake planning area.

	Alt. A.	Alt. B.	Alt. C.	Alt. D.	Alt. E.	Alt. F.	Alt. G
Scenic Integrity and Landscape Character	High	Moderate-Low	Moderate Low	Low	Moderate	Moderate	High-Moderate

Of the action alternatives, Alternative G would provide the highest Scenic Integrity and Landscape Character of the landscape. Barring the risk of wildfire, under the No Action Alternative scenic integrity and landscape character would remain high.

The degree of change in the landscape is based on the size and number of openings which are created. The visual objectives of Retention and Partial Retention have the highest degree of concern with regard to created openings. The table below displays the amount of acres by alternative in Retention and Partial Retention. Unit-specific information is contained in the project file. <u>All acres identified are approximate.</u>

Table III-230. Priest Lake Ranger District acres with Visual Quality Objectives (VQOs), by alternative.

Visual Objective	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Foreground Retention	394	332	332	278	366	413	6
Middleground Retention	225	244	244	153	90	40	0
Foreground Partial Retention	380	73	73	226	54	135	0
Middleground Partial Retention	3,276	2,289	2,289	2,437	2,167	1,808	122
Background Partial Retention	524	326	326	440	411	0	0
Total	4,799	3,264	3,264	3,578	3,088	2,396	128

Of the action alternatives, Alternative G would have the ability to best meet VQOs of Retention and Partial Retention. Road construction as proposed should have only a minor effect.

The No-Action Alternative shows the amount of acres which have a moderate to high probability of seen attacked trees (one tree or many trees). Not all the acres displayed under Alternative A will have red crowns.

The amount (acres) of trees left on the landscape that are seen depend on the percentage of crown closure which remains intact on the landscape. A crown closure of less than 40 percent is likely to be seen. Using design criteria, these units can be blended into the surrounding landscape. The table below shows the treated areas, by alternative, which would have crown closures of less than 40 percent. Unit-specific information is contained in the project file.

Table III-231. Acre in Retention and Partial Retention VQO areas estimated to have less than 40% crown closure after treatment, Priest Lake planning area.

Visual Objective	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Foreground Retention	0	113	113	56	81	202	0
Middleground Retention	0	182	182	81	28	0	0
Foreground Partial Retention	0	0	0	91	0	96	0
Middleground Partial Retention	0	767	948	859	649	932	0
Background Partial Retention	0	218	218	220	142	0	0
Total	0	1,280	1,477	1,363	900	1,230	0

Of the action alternatives, Alternative G would have the fewest acres below 40 percent canopy closure in Retention and Partial Retention VQO areas.

The No-Action Alternative was not evaluated in this category; however, the probability of continuous patches of Douglas-fir being reduced below 40 percent existing canopy closure is high in Retention and Partial Retention VQO areas.

The table below displays the acres in each of the priority areas with Retention and Partial Retention VQOs which would fall below 40 percent crown closure. This table indicates the predicted distribution of these openings over the planning area under each alternative. It is assumed that the Alternative A (No Action) acres shown which are not treated will also be reduced to below 40 percent canopy cover.

Table III-232. Predicted amount (acres) of stands in Retention (R) and Partial Retention (PR) VQOs that would fall below 40 percent crown closure, by alternative, by priority area, Priest Lake planning area.

	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt F		Alt. G	
AREA	**R**	**PR**	**R**	**PR**	**R**	**PR**	**R**	**PR**	**R**	**PR**	**R**	**PR**	**R**	**PR**
Binarch-Lamb														
Binarch	180	605	56	134	56	100	56	100	56	145	121	140	0	0
Bismark	32	218	45	73	45	73	0	97	0	91	0	91	0	0
Lakeface Granite														
Watson	275	462	188	39	188	39	91	136	28	6	6	215	0	0
Upper West Branch														
Tola	29	150	0	47	0	177	0	84	0	79	0	46	0	0
Pelke/Galena	0	91	0	62	0	62	0	66	0	49	0	0	0	0
Lower West Branch														
Ojibway	0	508	0	169	0	169	0	187	0	93	0	5	0	0
Flat Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moores	6	852	6	308	6	324	6	333	6	257	0	273	0	122
Quartz														
Quartz/Jasper	114	1327	0	119	0	136	22	146	13	132	75	564	6	0
Kalispell	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamb	0	9	0	0	0	0	0	0	0	0	0	0	0	0

Overall, Alternative G would have the least impact to the scenery resource.

Cumulative Effects at the Priest Lake Project Area Scale

Action Alternatives

The existing landscape has been altered both by human activities and natural occurrences such as insects and diseases, weather-related landscape changes and natural succession. The alternative with the least acres affected in Retention and Partial Retention would be the least impacting for the scenery resource and the overall cumulative effect on the landscape. Refer to the effects analysis for VQOs above. Alternative G would be the best and Alternative D would be the least. Artificial and natural regeneration helps to restore the openings only after a period of time. Approximately 10 to 20 years, the openings would blend into the landscape with no seen alterations.

Alternative A

Douglas-fir beetle activity in the landscape will continue, at least in the short-term. Douglas-fir trees will continue to die, creating heavy fuels for potential risk of wildfire. The scenery effects could be large openings on the landscape. Although these changes are natural, and therefore will not affect VQOs, they may not be attractive to look at and will be noticeable.

Effects of Opportunities

Road obliteration activities in Retention and Partial Retention would have a positive effect on the scenery resource. The straight line effects of roads would be eliminated in a short time from the landscape.

Consistency With the Forest Plan and Other Regulatory Direction

Visual Standard 1 (Meet adopted Visual Quality Objectives): All alternatives are likely to meet the VQOs listed in the Forest Plan for lands involved, although given the extent and locations of the infestations, some isolated exceptions could occur. The Forest Plan standards for visuals state the "Exceptions to meeting VQOs may occur in unusual situations: ...Examples of some exceptions are... large areas where the mortality rate for timber is very high."

Visual Standard 2 (Evaluate scenic resources based on visual sensitivity levels assigned to lands in and adjacent the Idaho Panhandle National Forests): All alternatives were evaluated based on visual sensitivity levels assigned in the Forest Plan. There were no adjustments of plan boundaries created by this project level analysis.

HERITAGE AND TRIBAL INTERESTS

REGULATORY FRAMEWORK

Heritage resources include buildings, sites, areas, and objects having scientific, historic, or social values. They comprise an irreplaceable resource relating past human life. The "keystone" legislation of modern heritage resource management is the National Historic Preservation Act of 1966 (amended and expanded in 1976, 1980 and again in 1992). All other heritage resource management laws and regulations support, clarify or expand on the National Historic Preservation Act. Federal Regulations 36 CFR 800, 36 CFR 63, and Forest Service Manual 2360 (FSM 2360) contain the basis of specific Forest Service heritage resource management practices. All of these laws, regulations and direction, guide the Forest Service in identifying, evaluating and protecting heritage resources on National Forest system lands. The Forest Service is required to assess the effect on heritage resources that are either determined to be eligible for inclusion in the National Register of Historic Places (NRHP) or heritage resources that are not yet evaluated for eligibility. Eligible heritage resources are termed "historic properties".. Specific locations of historic properties are exempt from disclosure under the Freedom of Information Act pursuant to 5 U.S.C. 552(b)(5).

A number of federal regulatory acts include increasing the role of tribes in the federal decision-making process. These acts include the Archaeological Resources Protection Act of 1979 which requires tribal notification and consultation where requested in regard to proposed removal of artifacts by permit from public lands; the Native American Graves Protection and Repatriation Act of 1990 which recognizes Indian control of human remains and certain cultural objects found on public lands and requiring consultation prior to authorized removal of such items; the National Historic Preservation Act of 1966, as amended in 1992, which more explicitly incorporates tribal involvement into the Section 106 consultation process and makes traditional use sites without physical remains eligible for listing in the National Register of Historic Places; and the Religious Freedom Restoration Act of 1993 which establishes a higher standard for justifying government actions that may impact religious liberties.

AFFECTED ENVIRONMENT

The Idaho Panhandle National Forests and the Colville National Forest have conducted heritage resource inventories of Forest lands beginning in 1976. From the data base of these known historic properties and other relevant information, heritage specialists have developed an understanding of what areas on the Forest have the greatest potential for containing historic properties. These previous inventories and accumulated knowledge guide the examination of any project area.

The chronology of human occupation of northern Idaho and adjacent areas of Washington can be broken down into three prehistoric periods. These include the Early Prehistoric Period (before 8000 years ago), the Middle Prehistoric Period (8000 to 2000 years ago), and the Late Prehistoric Period (2000 years ago to about 200 years ago). This is followed by the Proto-Historic period, when European cultures started to indirectly influence the Native Americans in the area (variable, but beginning in some areas 250 years ago to the actual coming of fur traders in the early 1800s).

The Kalispel and Coeur d'Alene Indians have occupied the northern Rocky Mountain area for thousands of years. Their settlements, at the beginning of the Historical Period, focused on the forest edges in valleys, around lakes and the camas grounds around Usk and Tensed. The Proto-Historic period had a significant impact on both the Kalispel and the Coeur d'Alene peoples in the form of exotic disease epidemics, including smallpox and measles, that spread in advance of contact with white populations and wiped out whole villages. As many as one half to one third of the population of Native Americans in the Northwest died during this period.

The beginning of the Historic Period (1809 to present), in northern Idaho and adjacent Washington, is marked by the arrival of fur trader David Thompson in 1809. The subsequent fur trade era and then the coming of the Jesuit missionaries in 1841 had a powerful impact on the Indian peoples. Changes that took centuries to occur in other parts of the country, spanned only a few decades in the Coeur d'Alene and Kalispel areas.

The construction of the Mullan Road from 1859 to 1862 is a time marker for the Coeur d'Alene River Basin. Before construction of the road, the basin was indisputably Indian territory and had an environment largely unaffected by man. The area population and environment swiftly changed after completion of the road. Thousands of prospectors flooded into the area in search of gold and silver starting in 1884. These miners gradually fanned out from the Coeur d'Alene Valley to other areas in the Idaho Panhandle and adjacent areas of Washington and Montana. The coming of the Northern Pacific Railroad in 1882 and the Great Northern Railroad in 1892 opened up the areas for further settlement and change. By 1900, the stands of commercial white pine in forests in the eastern United States were largely removed and lumber companies moved their operations into the Northwest. The mining and logging industries combined to dramatically change the character of the population and economy of the region.

Historic properties within the project area related to prehistoric periods include short term habitation and resource exploitation sites, locations of religious significance and routes of travel. The Proto-Historic Period may be represented by burials of Native Americans who died from disease epidemics brought to North America by Europeans. The historic properties related to the Historic Period include sites associated with mining, logging, homesteading, transportation and Forest Service administrative history.

ENVIRONMENTAL CONSEQUENCES

Methodology

When a project is proposed, Districts routinely involve heritage specialists in developing the project and analyzing environmental effects of the project. A heritage specialist reviews previous historical work, existing archives, overviews, the nature of the project, public involvement, and consults interested Native American groups (as defined in the ICBEMP, Appendices C, 1997). The geographic scope of the heritage resource analysis is the "area of potential effects". This is the geographic area within which a Forest Service project may cause changes in the character or use of historic properties, if any such properties exist.

A. Based on the above information the heritage specialist makes a judgement about the adequacy of existing heritage information to complete the environmental analysis and disclose effects on heritage resources. If there is insufficient information, the heritage specialist will develop a strategy to correct the deficiency. Once project alternatives are developed, the District defines the "area of potential effects" on historic properties in consultation with the heritage specialist considering both direct and indirect effects. A field inspection of the project area is required where no previous adequate inventory has taken place.

B. The heritage specialist designs a field inspection of the project area to locate all historic properties within the area of potential effects. If historic properties are located in the area of potential effects, they are documented thoroughly in order to make National Register of Historic Places eligibility determinations, provide adequate information for project planning, project redesign or restrictions or designation of sensitive areas where needed. This field work and background research is documented in a report and the heritage specialist coordinates recommendations, actions and monitoring with the project leader and the State Historic Preservation Office(s).

A project has an effect on a historic property when the project activities alter characteristics of the property that qualify the for inclusion in the National Register. For the purposes of determining effects, alteration to features of the property's location, setting, or use are considered.

A project is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse

effects on historic properties include, but are not limited to: physical destruction, damage, or alteration of all or part of the property; isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the National Register; introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting; and neglect of a property resulting in its deterioration or destruction.

A goal of the Forest Service heritage resource program is to manage heritage resources to prevent loss or damage before they can be evaluated for scientific study, interpretive services or other appropriate uses. Timber harvest is therefore implemented to avoid adverse effects on known historic properties. Where the proposed project results in impacts to historic properties, the project design incorporates sound preservation practices consistent with relevant standards. Project design assures that the essential form and integrity of historic properties is not impaired. If impacts to historic properties appear to be adverse, appropriate mitigation treatments are determined in accordance with 36 CFR 800.5. Mitigation of impacts for timber sales can include, but are not limited to, establishment of buffer zones, directional falling, alteration of harvest unit boundaries, changes in road locations, designation of skid trails away from historic properties, limiting the harvest methods in certain areas, seasonal limitations, and limiting slash disposal and tree planting activities.

In cases where a historic property is related to Native Americans heritage or religion, the Forest would consult with the appropriate tribal representatives to help identify appropriate mitigation measures.

In the event that cultural resources or human remains are encountered during program activities, the Forest has the authority to modify or stop harvest activities. The standard heritage resources protection provision C(T)6.24, would be included in all contracts. The provision requires that the contractors and the Forest Service representatives work together to protect historic properties. Failure of the contractor to identify historic properties encountered during the harvest constitutes a breach of contract. The provision specifically requires the contractor to notify the Forest of such discoveries.

To evaluate alternatives, the heritage specialist provides the project leader with information on all of the historic properties within the area of potential effect, their location, character, the nature of any potential effects and the possible mitigation measures of potential effects.

Direct, Indirect, and Cumulative Effects at the Priest Lake Ranger District Project Area Scale

Disturbance of historic properties resulting from timber harvesting activities could potentially result from road construction or reconstruction, tree falling, skidding, decking, and slash disposal. Certain types of historic properties are vulnerable to vandalism and looting. Construction or reconstruction of presently undriveable roads could result in indirect impacts by allowing the general public increased access to historic properties. As discussed above, appropriate mitigation measures would be implemented to avoid adverse effects. By eliminating or reducing direct and indirect effects by avoidance or other mitigation, no cumulative effects would occur.

A large portion of the Douglas-fir Beetle project area has been inventoried previously for heritage resources in conjunction with previous Forest projects. The known historic properties in the project area have been identified and considered in the development of project alternatives. The Forest is proceeding with consultation with the State Historic Preservation Office to determine the significance and effect of the project on the known historic properties. Areas not previously inventoried would be surveyed prior to implementation. These inventories would be reported to the State Historic Preservation Officers for both Washington and Idaho. No uninventoried sale would be sold prior to the inventory and consultation with the State Historic Preservation Officers. All historic properties would be protected and any effects would be mitigated in consultation with the State Historic Preservation Offices and, if necessary, the Advisory Council on Historic Preservation, the Kalispel Tribe of Washington and the Coeur d'Alene Tribe of Idaho prior to any timber sale or other land disturbing activity.

The Forest is in general consultation with the Kalispel Tribe of Washington and the Coeur d'Alene Tribe of Idaho concerning the nature of Douglas-fir Beetle Project. Tribal representatives received briefings concerning the nature of the project and the proposed action. They were afforded the opportunity to express their concerns with the project and the DEIS. The Kalispel Tribe highlighted their concern for the protection of one particular historic property. One result of these consultations is a more detailed treatment of Heritage Resources in the Final EIS.

Consistency with the Forest Plan

Standards for Cultural Resources (i.e. Heritage Resources) are listed on page II-26 of the IPNF Forest Plan. These standards would all be met by any action alternative.

FINANCES

REGULATORY FRAMEWORK

The IPNF's Forest Plan EIS (page IV-47) indicated, "The level of timber harvest is important not only in providing jobs in the timber industry, but also through indirect and induced impacts on other business sectors as well." One of the seven major issues for the IPNF's Forest Plan EIS was community stability (Forest Plan FEIS, pp.1-8). Forest Service policy sets a minimum level of financial analysis for timber sale planning (see Forest Service Handbook 2409.18 section 32).

AFFECTED ENVIRONMENT

Within northern Idaho, the Forest Service has been offering for sale 11 to 12 percent of the timber that was on the market the last few years. This figure is down from approximately 33 percent of the timber harvested during the late 1980s - early 1990s.

Based on the most recent information at the Forest level (TSPIRS, 1998), each million board feet of timber harvested on the IPNF annually results in a total of 39.2 jobs and $1,158,000 income for that year. These figures include the impacts associated with harvesting and processing timber plus the impacts of Forest Service salaries and investment and the 25% fund expenditures.

Stumpage prices are noticeably down across the United States at present, largely due to present financial problems of the Asian nations. However, timber markets in the northwest do not seem to have been depressed as much as those in the rest of the United States. This is probably due to the growth that the region is experiencing.

The local timber market could be further depressed if the Asian economic problems continue. Due to the large diameter of the trees that would be offered for sale under this project, stumpage prices are expected to be somewhat resistant to such market conditions because historically large trees tend to be more highly valued by mills, especially if they can be peeled for veneer.

The monetary value of the trees will also depend on how soon they are harvested. Although the Douglas-fir beetle does not cause direct damage to wood it does serve as a carrier of fungal spores that can greatly deteriorate the sapwood, then penetrate the heartwood. Other beetles, such as pinhole bores, flathead borers, and roundhead borers also effect the value of beetle killed timber as they too degrade the sapwood and speed the spread of fungal rot.

Recent local sales of Douglas-fir timber by the Forest Service have brought bids of $200 to $257 per thousand board feet. Bids received by the Idaho Panhandle indicate an upward trend in the current market.

ENVIRONMENTAL CONSEQUENCES

Methodology

This analysis deals only with project level financial attributes (predicted costs and revenues) of each alternative; and approached the analysis as though each alternative, that contained timber harvesting, was a group of timber sales. The timber sales were, in turn, logical groups of proposed harvest units. An appraisal was then preformed for each group of units as though they were actually being offered for sale at this time. Thus, the time value of money was not considered.

Because the market is not as robust as it has been, the analysis was made as real as possible; which was facilitated by the proposed harvest units being grouped into sale areas. Thus, stumpages and costs could be more accurately estimated and directly related to each other (so that the analysis would not be comparing averages where stumapge would perhaps be coming from one end of the district but the costs in reality were at the other end of the district in another sale area). In order to maintain the probability of financially viable timber sales, the units can be regrouped pending actual field measurements (such as cruised volumes and specie mix) and the timber market at appraisal time.

Different revenues and costs are associated with the management activities under each action alternative. To arrive at the expected stumpage a computer program was used to determine the potential stumpage (i.e. gross bid value) of timber harvested, on a sale by sale basis. The program runs the same regression equation that is contained in the Transactions Evidence (TE) appraisal model[1], used for appraising actual timber sales. The TE appraisal method predicts the value of timber (referred to as "stumpage") through the use of several independent variables developed from recent similar sales within Region 1 of the Forest Service (northern Idaho and western Montana). Since the information used is from actual bidding, current local market conditions, and production costs for logging and milling are reflected in the predicted rate.

Other costs, such as road maintenance, fuel reduction/site preparation (burning), and planting, were developed based on experienced District costs. Road construction and reconstruction costs were based on past costs in the project area and updated to today's costs. The project file contains detailed documentation of costs estimates.

Costs for road construction and reconstruction, reforestation, mitigation and other direct costs are deducted from the expected stumpage value. The costs of upgrading existing arterial roads (main travel/haul routes), to further reduce long-term risks to the watersheds, are included in the reconstruction costs.

The necessity of all proposed sale activity work (such as type and/or extent of fuel treatments, road work, etc.) that would be required of the purchaser was continually reviewed. Within the harvesting alternatives, watershed improvement work that sale purchasers could perform was identified, such as upgrading culverts, and/or removing culverts and closing roads. Due to government overhead, purchasers can accomplish work more economically.

Non-commodity values were not included in this analysis because these resources are evaluated under the specific resource section. Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) indicated that "For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are qualitative considerations." Effects on resources are documented in individual resource sections.

The description of the features of the alternatives presented in Chapter II was used for the financial analysis. The table below identifies additional features that would affect the finances of a commercial timber sale for each alternative. No timber would be offered for sale if Alternatives A or G were implemented.

[1]The 1999 second-quarter (W99C2) Transactional Evidence (TE) model was used to arrive at the expected stumpage value for the action alternatives containing a harvesting feature.

Table III-233. Additional Features Affecting Financial Analysis of Commercial Timber Sales, Priest Lake Ranger District.

Feature	Alt. B	Alt. C	Alt D	Alt E	Alt F
Net Volume (million board feet)	54.5	55.4	69.9	41.0	34.9
Yarding Systems Used (Percent of Volume)					
Tractor	20	16	15	20	23
Skyline	50	21	44	49	39
Helicopter	31	58	35	32	30
Average Diameter of Harvested Trees (Inches)	15	15	15	16	15

Table III-234. Cost Estimated for Project Activities, Priest Lake Ranger District.**

Roads: Timber Sale	**Cost**
Maintenance (During Sale)	$0.54/mile/mbf
Maintenance (Presale)	$500/mile
Reconstruction for Erosion Prevention	$1,000/mile
Light Reconstruction	$7,000/mile
Heavy Reconstruction	$15,000/mile
Level 1 Obliteration	$7,000/mile
Level 2 Obliteration	$15,000/mile
New Road Construction (Temporary)	$6,080/mile
Roads: Forest Service*	
Light Reconstruction	$12,390/mile
Heavy Reconstruction	$26,550/mile
Level 1 Obliteration	$12,390/mile
Maintenance (Presale)	$26,550/mile
Fuel Treatment: Purchaser	
Helicopter Yarding Tops:	$40/MBF
Lop and Scatter Slash	$53.85/Acre
Grapple Pile slash with a machine (excavator)	$321.91/Acre
Pile slash at landings:	$718.36/Acre
Fire Line constructed by hand	$80.78/Chain
Fire Line constructed by machine	$25.85/Chain
Fuel Treatment: FS*	
Burn Grapple Piles:	$158.06/Acre
Burn slash at landings:	$158.06/Acre
Underburn in units for slash reduction and site preparation	$499.25/Acre
Essential Regeneration*	
Plant (8x8 ft spacing):	$618.08/Acre
Stocking Surveys (3 each per acre planted)	$41.84/Acre

** Includes overhead*

*** Road Maintenance terms are defined on the inside of the back cover of the document.*

Direct, Indirect and Cumulative Effects at the Priest Lake Ranger District Project Area Level

Timber harvest from the action alternatives would contribute to continuing operation of local mills, this, directly and indirectly enhancing the local and state economy through employment and tax revenues. These features would also be enhanced through employment created through the planned restoration activity work outside of the timber sale contracts. Additionally, 25 percent of timber receipts goes directly to Bonner and Boundary Counties in Idaho and Pend Oreille and Stevens Counties in Washington for public schools and roads.

It is anticipated that the sale of Douglas-fir beetle killed timber, from National Forest Lands, will have very little effect on the price that private land owners will receive for their timber over the next two years for two reasons:

- *Most private landowners that also have beetle infested/killed timber have already made arrangements to have their trees harvested because the spring flight of the beetles is imminent; and they will be wanting to commercially capture the value of the trees.*

- *In the last several years, the Forest Service portion of the total sawtimber log market for North Idaho has constituted 10% to 12% of the market. The timber in this proposal will substitute for the majority of the IPNF's normal timber program for the next two years. Local timber company representatives have expressed no concerns about the Forest Service potentially "flooding the market" with Douglas-fir sawtimber.*

The following table provides a summary of the financial appraisal of each alternative.

Table III-235. Cost/Revenue Summary, Priest Lake Ranger District.

	Costs/Revenue						
	A	B	C	D	E	F	G*
Timber Sale Revenue							
(1) Stumpage Value (gross)	$0	$14,242,895	$11,795,381	$18,238,304	$10,444,646	$8,812,572	NA
(2) Total MBF	0	54,504	55,384	69,928	41,041	34,909	0
Timber Sale Costs Affecting Predicted Bid							
(3) Road Maintenance (During)	$0	$344,089	$348,520	$453,746	$261,306	$391,878	$0
(4) Road Maintenance (Presale)	$0	$7,500	$7,850	$7,500	$7,500	$3,350	$0
(5) New Road Construction (including new rd oblit)	$0	$80,803	$0	$87,491	$70,528	$48,032	$0
(6) Road Reconstruction	$0	$704,200	$691,600	$705,600	$703,500	$318,500	$0
7) Road Obliteration (Sale Contract)	$0	$119,900	$131,800	$159,100	$114,300	$66,500	$0
(8) Slash Disposal/Site Prep (Purchaser)	$0	$428,580	$450,208	$543,283	$509,020	$355,978	$0
(9) Slash Disposal/Site Prep (FS))	$0	$1,640,674	$1,029,942	$1,997,104	$658,359	$1,039,905	$235,642
(10) Noxious Weed Control (purchaser)	$0	$3,571	$3,590	$3,757	$3,542	$1,790	$4,263
(11) Total Sale Contract Costs = Sum line 3 through line 10	NA	$3,329,317	$2,659,920	$3,953,825	$2,324,513	$2,224,144	$239,905
(12) Predicted Bid Value (net) = Line 1 - Line 11	NA	$10,913,578	$9,135,460	$14,284,479	$8,120,133	$6,588,428	NA
(13)Predicted bid/MBF = Line 12/ Line 2	NA	$200.23	$164.95	$204.27	$197.85	$188.73	NA
						* Not a timber sale cost	
Other Project Costs							
(14) Reforestation	$0	$1,608,789	$1,469,164	$1,872,734	$916,442	$1,179,525	$238,989
(15) Road Obliteration (FS) for watershed restoration	$0	$447,899	$447,899	$457,811	$444,182	$361,169	$1,945,268
(16) Total Other Costs = Line 15 + Line 14	$0	$2,056,688	$1,917,062	$2,330,544	$1,360,623	$1,540,693	$2,184,257
(17) Value of Timber Sale Projects (Line 11 + Line 14)	$0.00	$4,938,106	$4,129,084	$5,826,559	$3,240,955	$3,403,668	$478,894
(18) Per MBF = Line 16/Line 2	NA	$90.60	$74.55	$83.32	$78.97	$97.50	NA
(19) Difference Between Predicted and Project Value per MBF = Line 13 - Line 18	NA	$109.63	$90.39	$120.95	$118.89	$91.23	NA
Other Forest Service Costs							
(19) Planning	$790,508	$790,508	$790,508	$790,508	$790,508	$790,508	$790,508
(20) Sale Preparation	$0	$1,513,175	$1,537,785	$1,938,870	$1,109,646	$119,645	$0
(21) Harvest and Engineering Administration	$0	$228,966	$189,850	$288,619	$179,584	$119,645	$1,540
(22) Net Value (Line 12 - Line 16 - Line 19 - Line 20 - Line 21)	NA	$6,324,241	$4,700,254	$8,935,938	$4,679,770	$4,017,937	($3,214,67-0)
(23) Present Net Value (Discounted)	NA	$6,210,120	$4,612,187	$8,727,682	$4,529,763	$4,004,104	($2,912,72-3)
(24) 25% Fund (County) = Line 12 * .25	$0	$2,728,395	$2,283,865	$3,571,120	$2,030,033	$1,647,107	$0

** Costs of FS Road obliteration in Alternative G include reconstruction, maintenance and obliteration.*
**G - No timbersale is associated with Alternative G.*

Definitions

The **stumpage value** in the table reflects the size of timber harvested (average diameter), volume per acre, species composition, planned yarding method (helicopter, skyline, cable or tractor) and hauling distance (on paved and unpaved roads). **Timber sale costs** are those other costs that are considered in the timber purchaser's bid including contractual requirements. The timber purchaser is billed for Forest Service slash treatment to be completed after the sale.

The **predicted bid** is the stumpage price, minus the total of the other contractual costs. The estimated bid per thousand board feet is calculated by dividing the predicted bid by the estimated volume. Generally, the predicted bid is expected to be lower than the historical local bid for this type of timber, due largely to the value of the contractual items planned. Normally, a timber sale would not have as much road obliteration or reconstruction which is planned for watershed restoration. The other contractual items are generally indicative of the type and amount of contractual work required in a timber sale.

The value of timber sale projects was determined by adding all the contractual items, plus cost of regeneration. This number indicates how much "cushion" is available in the bid before some of the projects would not be funded. In otherwords, it shows how much the price of a bid could fall, on the average, due to market forces and still cover anticipated work. On a sale by sale basis, this number was used to determine below cost sales when the value of timber sale projects was higher than the predicted bid (see below cost sales below).

Alternatives B, C, E and F would produce forest products over both the short and long terms; traditional employment opportunities in the woods product industry would be similarly affected. Employment opportunities could also occur from planned restoration under all action alternatives.

Not managing the timber resource in this area (as under Alternatives A and G) would result in a loss of mature timber (of commercial size) to disease and insects reducing expected future revenues.

Timber sales offered under this proposal would be in replacement of other planned sales for the next one to two years, thus the local timber market is not expected to be affected by an additional large volume of timber.

Timber Management Financial Viability

Implementing stand-management treatments would depend on having financially viable timber sales that the local forest products industry is willing to purchase. Generating funds to help finance watershed and wildlife projects while having sales that are not below cost is also desirable. For this analysis, all identifiable costs associated with the timber sales (administration, mitigation, monitoring, sale preparation, and sale execution), were included.

Below Cost Sales

When viewed as individual potential sale areas, Alternative F has four sales (out of eight) that appear to be below costs. Alternative B has three sales that appear to be below costs; Alternatives C and E have two sales that appear to be below costs. In Alternative D, one sale appears below costs. Most of these are due to Forest Service costs for planning, although Alternative B, C, and E have one sale where the predicted bid is lower than the timber sale contractual costs and regeneration, indicating that it may not sell as proposed (Alternative F has two of these, Alternative D has none). In potential sale areas where contract costs are above predicted bid, road work or units may be shifted to another sale to improve the financial condition at the time of sale package preparation.

Cumulative Effects

Timber sales offered under this proposal in the Newport, Priest Lake and Coeur d'Alene areas would be in replacement of other planned sales for the next one to two years, thus an additional large volume of timber would not affect the regional timber market. Additional timber from private and state sources may have already landed in the market at a higher rate that would normally have occurred.

Consistency With the Forest Plan

Forest-wide goals, objectives, and standards for finances are not specifically addressed in the Forest Plan. This issue is addressed indirectly in the discussion of community stability. Chapter II of the Forest Plan states, "Management activities will continue to contribute to local employment, income, and life-styles. The Forest will be managed to contribute to the increasing demand for recreation and resource protection while at the same time continuing to provide traditional employment opportunities in the woods product industry," (Page II-11, Objectives).

All the alternatives would meet this Forest Plan direction.

INTRODUCTION

The Newport Analysis Area is located on the portion of the Kaniksu National Forest administered by the Colville National Forest. A vicinity map is included in the map packet. The analysis area is about 59,200 acres in size, of which about 52% are National Forest System lands. This analysis area is located about 4 miles northwest of the town of Newport, which is the county seat and largest city in Pend Oreille County, Washington. It is located adjacent to the Lower West Branch and Upper West Branch anlaysis areas on the Priest Lake Ranger District; and about 40 miles northwest of the Hayden analysis area near Coeur d'Alene. There are no livestock allotments in this portion of the Newport Ranger District; therefore this chapter does not include a discussion of grazing.

Because this analysis area is administered by the Colville National Forest, the Colville National Forest Land and Resource Management Plan (1988), hereafter called the Colville Forest Plan, provides management direction for this area. All lands on the Forest are divided into management areas (MA's), which emphasize specific resources through management prescriptions. The goal of each MA is briefly described in Chapter II, detailed information is provided in the Forest Plan on pages 4-69 through 4-108. For this area, the Colville Forest Plan has been amended twice. Regional Forester's amendments 1 and 2 (1995) provide a process to evaluate the consistency of commercial timber sales with ecosystem management principles. The purpose of these amendments are to preserve old forest abundance and wildlife habitat in late and old structural stages and to protect native fish habitats. Riparian standards were adopted from the Inland Native Fish Strategy INFS). Both amendments were designed to be interim measures pending a decision on the Eastside Environmental Impact Statement.

Approximately 5,275 acres of the NFS lands in the Newport anlysis area have beetle-caused mortality. Most of the infested stands are losing ¼ to ½ of their basal area. To obtain an estimate of acres that could potentially become infested in the Newport analysis area, a Douglas-fir beetle hazard rating system was developed using tree and stand parameters conducive to Douglas-fir beetle infestations. Inventoried stands were rated and assigned a high, moderate or low probability of being infested by Douglas-fir beetles. Across the Newport analysis area, about 8800 acres were rated as high hazard or moderate hazard to Douglas-fir beetle attack.

The Biology of the Douglas-fir Beetle

The Douglas-fir beetle (*Dendroctonus pseudotsugae*) infests and kills Douglas-fir throughout most of its range in the western United States, British Columbia and Mexico. At low or endemic levels, the beetle infests scattered trees, including windfalls, and trees injured by fire scorch, defoliation, or root disease; or in a weakened condition due to drought. Where such susceptible trees are abundant, beetle populations can build up rapidly and spread to adjacent green, standing trees (Schmitz and Gibson 1996).

Susceptibility is greatest in stands having the following characteristics:

- *Basal area per acre is greater than 120 square feet,*
- *Douglas-fir species composition is greater than 30%,*
- *Douglas-fir diameters (dbh) are greater than 14 inches, and*
- *The stand is more than 120 years old.*

Historic Douglas-fir Beetle Outbreaks

One of the earliest recorded Douglas-fir beetle outbreaks in northern Idaho was during the period of 1950-52 (Timber Industry, Bureau of Entomology and Plant Quarantine, USDA Forest Service, 1953). It is likely that heavy snows in the winter of 1948-49 resulted in significant blowdown and breakage which most likely

triggered the Douglas-fir beetle outbreak. On lands now administered by the Idaho Panhandle National Forests, an estimated 338,600 acres were infested. During this outbreak, some timber stands lost up to 80% of the mature Douglas-fir component.

On the Clearwater National Forest from 1970-74, an outbreak occurred after Douglas-fir beetles reproduced in trees felled during the clearing for Dworshak Reservoir and in snow-broken Douglas-fir surrounding the reservoir (Furniss, McGregor, Foiles and Partridge 1979). An estimated 288,000 acres were infested and 111 million board feet of sawtimber recorded as salvageable.

Another outbreak on the IPNFs occurred from 1987-1990 when 31,900 acres were infested and 38 million board feet were killed (Kegley 1998).

Recent endemic Douglas-fir beetle distribution and infestation levels in the subbasin have been high. Dry years have been frequent in the last decade; Douglas-fir root disease has also expanded. Due to the increase in Douglas-fir which resulted from exclusion of wildfire, white pine blister rust, and past logging practices; Douglas-fir beetle outbreaks have the potential to occur over large areas.

Douglas-fir beetle outbreaks are generally of short duration in the coastal Douglas-fir region but last longer in the Rocky Mountains (Furniss and Carolin 1980). Outbreaks average four years in eastern Washington (Flanagan 1998). Beetle populations are expected to decline over the next two years, but additional tree mortality is expected.

Weather may influence the survival of Douglas-fir beetle populations. Cool, wet conditions in the spring during the beetles' flight period are probably more important than cold winter temperatures. Constant cool, rainy spring weather may disrupt the flight period and cause the beetles to be exposed to adverse conditions for longer than normal periods of time. Conversely, warm dry weather in the spring is beneficial to the beetles. Cold temperatures experienced by overwintering Douglas-fir beetles have been recorded only once as causing significant beetle mortality. This occurred in 1955 when extreme sudden and severe cold weather occurred in early November in British Columbia at a time when the beetles were probably not yet prepared for such conditions (McMullen 1956). However, severe temperatures that occurred in mid-November 1955 and again in February, 1956 in Idaho failed to cause widespread unusual overwinter mortality of Douglas-fir beetles (Furniss 1956).

More detailed temperature studies have been conducted on a closely related beetle, the mountain pine beetle. Winter temperatures below -34 degrees Fahrenheit may affect mountain pine beetles infesting lodgepole pine in low-lying areas; however, beetles survive on warmer slopes, in thicker barked trees and in portions of tree trunks below snow line (Amman et al. 1989). It is reasonable to conclude that survival would be greater for Douglas-fir beetles in thicker barked Douglas-fir trees. Air temperatures below -20 degrees Fahrenheit for several days in December 1990 were insufficient to cause a decreasing population trend in mountain pine beetles in ponderosa pine (Schmid et el. 1993).

Several natural enemies have been recorded feeding on Douglas-fir beetles. Among those regarded as important in natural control of the Douglas-fir beetle are the predatory beetles *Enoclerus sphegeus*, *Thanasimus undatulus*, and *Temnochila chlorodia*; and the parasites *Coeloides vancouverensis* and *Medetera aldrichii* (Marsden et al. 1981, Furniss & Carolin 1980). However, numbers of natural enemies appear to be independent of prey density. Their influence increases after the bark beetle population subsides. Douglas-fir beetle populations are maintained at normal levels primarily by tree resistance (Furniss et al. 1981). Woodpeckers are not important predators of the Douglas-fir beetle (Schmitz & Gibson 1996).

Current Douglas-fir Beetle Outbreak

Information on the current beetle outbreak was obtained through an aerial insect detection flight conducted in the late summer of 1998, and on-the-ground surveys of sites with active beetle populations in the fall and early winter of 1998.

Populations of Douglas-fir beetles increased after breeding in large amounts of Douglas-fir trees that were wind thrown and broken by snow and ice during the winter of 1996-97. The beetle population grew, breeding in the downed Douglas-fir through the spring and summer of 1997. Some standing, live trees were attacked this first year, but many more were attacked in the spring, summer and fall of 1998. The warm and dry summer of 1998 provided optimum conditions for a late summer beetle flight. With the trees in a weakened condition due to the dry summer, and the rapid growth of the beetle population, the tree mortality reached an epidemic level. In many areas, live trees were covered with the dust from beetles boring into the bark (frass). Special traps placed in the woods to monitor beetle flight confirmed that beetle activity was epidemic in level.

It normally takes one year for currently infested trees to fade. However, because of the abnormally hot and dry summer, some fading trees appeared in the late summer of 1998. Aerial detection flights in the late summer of 1998 were used to assess the location and magnitude of the outbreak. The number of dead trees varied from a few scattered individuals to entire stands where most of the large Douglas-fir have been killed. The detection flights could only pick up those trees which were showing symptoms (the crown was starting to turn yellow or red) of the Douglas-fir beetle attacks. There may have been some areas where affected trees were not yet showing symptoms and were therefore not mapped during the flight.

Field inspections indicated that the number of trees actually attacked by beetles was much higher than the number of trees showing the symptoms of these attacks. Results of preliminary ground surveys indicated that there were from 1 to 19 green infested trees for every fading tree. The average was about 8 trees attacked by beetles for each one showing obvious crown symptoms at the time of the detection flight. Groups of from 3 to 200 trees were beginning to fade by fall of 1998. The full extent of the 1998 infestation won't be readily apparent from aerial surveys until the remaining currently infested trees fade during summer 1999.

The current beetle outbreak could be as large as the outbreaks that occurred in the early 1950s and 1970s, especially if drought conditions continue. The Forest Service assembled a group of 24 scientists and researchers[1] from several western states in December 1998 to review this specific beetle outbreak and the Forest Service's proposed actions. They estimate the IPNFs have currently experienced about fifty percent of the total mortality that is estimated will develop. Across the IPNFs, 250,000 acres rated as moderate and high hazard to Douglas-fir beetle attack.

Stands with a high component of large Douglas-fir (greater than 14 inches in diameter) are most susceptible to attack and are likely to lose the greatest number of trees (Lockman, B., Gibson, K., 1998). Douglas-fir mortality is likely to occur in groups of trees due to the pheromones produced by the bark beetles which attract more beetles to the area. This leads to mass attacks where 60-80 percent of the large Douglas-fir can be killed (Flanagan, P., 1998). Smaller diameter trees are also often attacked when they occur near these groups, especially in denser stands.

Reasonably Foreseeable Activities

The effects analysis described in the following sections considered other activities that are either reasonably foreseeable or are actually ongoing at this time. These activities are identified in Appendix E - Reasonably Foreseeable Activities.

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[1] *Dr. Bary Daterman, Dr. Ladd Livingston, Dr. Darrell Ross, Dr. Jose Negron, Dr. Karl Stoszek, Sandra Kegley, Carol Randall, Karen Johnson, Ken Gibson, Karen Ripley, Larry Stipe, Dayle Bennett, Ralph Thier, Dr. Nancy Strudevant, Dr. Paul Flanagan, Dr. Darryl Jewett, Dr. Jim Byler, Dr. Field Cobb, Dr. Gregg DeNitto, Craig Schmidtt, Dr. Robert James, Jim Hadfield, Blakey Lockman, and Dr. Arthur Zack.*

VEGETATION

CHANGES BETWEEN THE DRAFT AND FINAL EIS

In response to comments, all the vegetation related resources were placed together in the FEIS. Forest Vegetation is followed by TES plants and Noxious Weeds. In response to comments and recognition of errors in the Draft EIS, the Final EIS has changes in the vegetation section. A brief summary of the changes are as follows: minor changes have taken place in the analysis numbers in most alternatives. Many wording and other editing changes have taken place to further clarify the information provided. The structural stage analysis has been completely redone after gathering more data. The description of cumulative effects and foreseeable actions has been expanded. Several units have changed prescription from thinning to salvage only.

REGULATORY FRAMEWORK

The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), the National Forest Management Act of 1976 (NFMA), provide the broad legislative background for forest vegetation management. The Colville Forest Plan provides local direction for forest vegetation management activities.

RPA states "It is the policy of Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth and conditions of stands designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans."

NFMA amended RPA and requires that stands of trees shall generally have reached the culmination of mean annual increment of growth prior to harvest but this does not preclude the use of sound silvicultural systems such as thinning and other stand improvement measures and also allows salvage or sanitation harvest following fire, windthrow or other catastrophic events or within stands in imminent danger of insect and disease attack.

Forest Service policy directs:

1) Use only those silvicultural practices that are best suited to the land management objectives for the area. Consider all resources as directed in the appropriate forest plan.
2) Prescribe treatments that are practical in terms of cost of preparation, administration, transportation systems and logging methods.
3) Monitor practices using procedures specified in forest plans to ensure objectives are met.
4) Before scheduling stands for regeneration harvest, ensure, based on literature, research or local experience, that stands to be managed for timber production can be adequately restocked within five years of final harvest. Five years after final harvest means five years after clearcutting, final overstory removal in shelterwood cutting, the seed tree removal such as in seed tree cutting or after selection cutting.
5) Perform all silvicultural activities in the most cost effective manner consistent with resource management objectives.
6) The size of tree openings created by even-aged management will no longer be considered openings when both vegetation and watershed conditions meet management objectives established for the management area.
7) Management activities will promote programs that provide a sustained yield of forest products consistent with the multiple-use goals established in Regional Guides and the Forest Plan.

8) Timber management activities will be the primary process used to minimize the hazards of insects and diseases and will be accomplished primarily by maintaining stand vigor and diversity of plant communities and tree species.
9) Protection of timber stands from insect and disease problems will center around the silvicultural treatments prescribed for timber management activities.
10) Proposed activities will be consistent with Management Area objectives. Descriptions and objectives of these Management Areas are included in the Forest Plan.

Amendments to the Forest Plan: Regional Forester's Amendment Nos. 1 and 2 and the Inland Native Fish Strategy

An evaluation process was developed by the Pacific Northwest Region (Regional Forester's Amendments Nos. 1 and 2, 1994 and 1995). Its purpose is to assess the consistency of proposed commercial timber sales with ecosystem management principles. Special emphasis is given to protecting wildlife habitat associated with late and old forest structure and old forest abundance. Salvage sales, thinning and understory removals located outside currently mapped old growth are only subject to the wildlife standard. The project file contains a complete description of how the standards were applied in this project. Mitigation needed to meet the standards is included in Chapter II.

In 1995 the Regional Foresters adopted the interim Inland Native Fish Strategy (INFS). Its purpose is to protect native inland fish. The INFS standards replaced the riparian standards in the Regional Forester's Amendments. No timber harvest is proposed in Riparian Habitat Conservation Areas.

Wildlife standard: The emphasis is to protect large trees, develop and enhance late and old structure (LOS) and to protect goshawks. Live trees over 21 inches diameter at breast height (DBH) are to be maintained. Connectivity is to be maintained between LOS stands, pine marten management areas, pileated woodpecker management areas and MA 1. Snags are to be retained at levels to provide 100% population potential for primary cavity excavators. Down logs are to be protected at levels specified in the Regional Forester's Amendments Nos. 1 and 2. Goshawk nests are to be protected.

When one or both types of LOS are below the historic range of variability in a particular biophysical setting within an analysis area, then there should be no net loss of LOS from timber sale activities. Some timber sale activities can occur within LOS stages that are within or above HRV in a manner to maintain or enhance LOS within that biophysical setting. It is allowable to manipulate one type of LOS to move stands into the LOS stage that is deficient if this meets historical conditions.

Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components, as much as possible, in stands subject to timber harvest.

General Description of the Vegetation Communities and the Douglas-fir Beetle Infestation

Information for National Forest System lands on habitat types, forest cover types, forest structural stage and past harvest activity are based on existing data bases that were developed from stand exam information, historical records, satellite remote sensing data, ecological modeling and aerial photo interpretation. Information on private lands within the analysis area is more limited. Most of the private land information was obtained through aerial photo interpretation and observations.

Habitat Type Groups and Biophysical Settings

The habitat type classification system was developed to characterize land based on potential climax communities. Areas that have the same climax communities are similar in their overall moisture, temperature and disturbance characteristics. These climax communities are the conceptual "endpoints" of plant

succession that would occur in the absence of disturbance. Habitat types are named for the potential climax community type or plant association which is denoted by the climax tree species (usually the most shade tolerant tree adapted to the site) and the dominant or indicator undergrowth species of the plant association (Cooper et al 1991; Williams et al 1990). The climax tree species denoted in a habitat type name is not necessarily dominant or even present on the site. Often the climax species are poorly adapted to the natural disturbance regimes, and were relatively rare historically.

In contrast to habitat types, cover type (also called forest type) is the existing, dominant tree vegetation. At different stages of succession the same forest type can occur on different habitat types. Historically, the forest types dominated by shade tolerant climax species were not abundant on the landscape because disturbance frequently moved stands back to early stages of succession or removed the less fire resistant species. Conditions then favored the shade intolerant, fire resistant species.

Different classification systems are useful for different types of analysis. For noxious weeds, the most useful classification is cover type, and that is used for the analysis in the noxious weed section later in this document. For an analysis of threatened, endangered and sensitive plants, the most useful classification system is rare plant guilds. These are similar to habitat type groups discussed below. Threatened, endangered and sensitive plants are discussed later in this document.

Although every habitat type is unique in some way, they can be grouped based on similarities in natural disturbance regimes, successional patterns and structural characteristics of mature stands.

Region 6 of the Forest Service uses a vegetation classification system very similar to habitat types called "plant associations" (Williams et al 1990). For this project, crosswalks were developed to reclassify the vegetation at Newport into habitat types, the classification system used by Region 1. The project file contains a listing of the plant associations and equivalent habitat types and how they were grouped.

Region 6 also uses a land classification system described in the Regional Forester's Amendment Nos. 1 and 2 called "biophysical settings". The relationship between habitat type groups and biophysical settings are described below.

Biophysical Settings 3 and 5 (The Dry Habitat Type Group)

Using the biophysical settings (BS) concept developed by the Colville and Okanagon National Forests[1], these areas would be classified as biophysical settings 3 and 5. Biophysical setting #3 is Douglas-fir/grand fir with tall shrubs. This Biophysical Setting constitutes 52% of the analysis area (42% of NFS lands), and is the dominant Biophysical Setting in the southern part of the analysis area. This Biophysical Setting generally occurs on midslopes and ridges on south and west aspects. Biophysical Setting #5 is Douglas-fir/grand fir with huckleberry. This Biophysical Setting constitutes 4% of the analysis area (6% of NFS land). This Biophysical Setting generally occurs on cooler, drier benches.

The forest types found on this habitat type group consist primarily of Douglas-fir, ponderosa pine and western larch. This group represents 58% of the analysis area. Historically, these sites were maintained in grassy and open park-like conditions of large, old ponderosa pine and Douglas-fir (Fischer, 1987) with larch mixed in on the more moist sites. Prior to the Euro-American settlement, light underburns occurred on an average of 25 years. These underburns maintained this open stand structure. Mixed severity fires and stand replacement fires were relatively infrequent under this disturbance regime.

[1] *See Regional Forester's Amendment #1 for a description of biophysical environments also called biophysical settings.*

Biophysical Settings 11 and 12 (Moist Habitat Type Group)

These habitat types generally would be classified as biophysical settings 11 and 12. Biophysical Setting #11 is Cedar/hemlock with forbs and shrubs. This Biophysical Setting constitutes 39% of the analysis area (45% of NFS land), and dominates the northern part of the analysis area. This Biophysical Setting generally occurs on mid to lower slopes and generally on north and east aspects. Biophysical Setting #12 is Cedar/hemlock, moist bottom lands. This Biophysical Setting constitutes about 2% of the analysis area (3% of NFS land) and occurs in valley bottoms and lower slopes with high water tables. It includes alder shrublands and wet meadows.

The forest types found on this habitat type group consist primarily of western redcedar, western hemlock, western larch, Douglas-fir, grand fir, western white pine and lodgepole pine. These are the most common forest types on mid-elevation sites in the mountains of northeastern Washington and northern Idaho. Prior to the introduction of blister rust, when white pine was a dominant species, the area was known as the "White Pine Type". Currently, 2% of the entire Newport analysis area is classified as western white pine cover type. These forests are very productive and produce high levels of woody biomass between the long stand-replacement fire intervals.

Biophysical Setting 7 (Moderate Subalpine Habitat Type Group)

This habitat type group would generally be classified as biophysical setting #7. Biophysical Setting #7 is Subalpine fir with forbs and shrubs. This Biophysical Setting constitutes about 3% of the analysis area (4% of NFS land). This Biophysical Setting generally occurs on high elevation ridgetops.

These are mostly the cooler subalpine fir habitat types within the area. The fire free interval of these types is 50-130 years (Fischer, 1987). The periodic fire disturbances and high amount of low to moderate fire severity favors species such as lodgepole pine, Douglas-fir and western larch. Other common species on these sites are subalpine fir and Englemann spruce. Sites in this habitat type group are quite frosty.

Non-forest lands constitute about 15% of the Newport analysis area. These lands includes dry meadows, rocklands, persistent brushfields, and cleared agricultural lands.

Table III-236. Biophysical settings in the Newport analysis area.

Biophysical Setting	All Ownerships (acres)	% of Analysis Area	NFS Land (acres)	% of NFS Land
BS 3	30,791	52%	13,004	42%
BS 5	23,68	4%	1,858	6%
BS 7	1,776	3%	1,238	4%
BS 11	23,093	39%	13,932	45%
BS 12	1,184	2%	929	3%

AFFECTED ENVIRONMENT

This landscape has experienced a change in species composition, age composition, and stand density over the past 100 years. These changes are due to a variety of factors, primarily fire exclusion, white pine blister rust and timber harvest.

Based on recent findings presented in the Interior Columbia Basin Ecosystem Management Project (Quigley, 1997), disturbances such as fire and insect mortality, have played an important role in determining forest composition throughout the Interior Columbia Basin. In this area, the most significant historic natural disturbance was fire. In addition to natural disturbance, the Columbia Basin Assessment found land

management activities and introduced pathogens have dramatically altered the species and age composition of vegetation resulting from a natural disturbance regime.

The vegetation composition was historically dominated by species such as ponderosa pine, western larch, and western white pine. These long-lived tree species were typically established after some form of disturbance and have the potential to occupy a site for 200-300 years. Historic levels of insect populations along with wind and winter storm damage contributed to stand mortality and over time created conditions for large stand replacing fires.

With the loss of much of the white pine due to the introduction of white pine blister rust, effective reduction in wildfires, and land management activities such as logging, the character of the forest has changed. The forests are now dominated by grand fir, western hemlock and Douglas-fir, species which are adapted to more shade and are more vulnerable to disturbances such as insects, diseases and fires. These shade-tolerant species are less fire and drought adapted and less adapted to natural climatic variability than the species they replaced. The result is more insect and disease problems, and greater high-severity fire risk from higher fuel buildups. The magnitude of the Douglas-fir beetle outbreak is related primarily to the increase in abundance of Douglas-fir, the damage caused during the 1996-97 winter storms, and the dry, hot summer experienced in 1998.

The Newport District completed an Ecosystem Analysis at the Watershed Scale (refer to the project file) in 1995 for the northern portion of the analysis area. Findings of Ecosystem Analysis, at least in relation to vegetation disturbance, are very similar to more broad-scale conclusions found at the Columbia Basin and Northern Region scales.

1. Disturbance and successional regimes have been altered since Euro-settlement in the area.

2. There has been a substantial reduction in the percent of the landscape composed of early seral tree species such as western white pine, ponderosa pine, larch and whitebark pine. This is primarily the result of fire suppression, timber harvest and the introduction of white pine blister rust.

3. There has been a shift in forest structure. The exact nature of these shifts vary somewhat by biophysical setting, but in general, the landscape has too much of the middle structures and too little of the late and old structural stages. This is especially true in the dry habitat types where open, park-like stands of large trees are significantly below historic conditions (see Table III-239). This is primarily the result of timber harvest and suppression of fire. The project file contains additional information about this analysis.

4. Landscape patterns have been modified by timber harvest and fire exclusion. Openings are more numerous and patch sizes are reduced.

5. There is an increased risk of catastrophic fire due to fuel accumulations resulting from fire exclusion. Most of the fuels are green trees within overstocked stands where dense crowns can now support crown fires. This green undergrowth provides both fuel ladders and increases in crown bulk density . This increases the risk of crown fire.

Inherent Disturbance Processes

The following disturbance processes shaped the vegetation landscape before Euro-American settlement.

FIRE

Fire is the major disturbance process that profoundly influences vegetation across this landscape (Quiqley, 1997; Smith and Fischer 1997). Fire has burned in every ecosystem and virtually every square meter of the coniferous forests of northern Idaho and eastern Washington. Fire was the principle agent for the

widespread occurrence and even existence of western larch, lodgepole pine, western white pine and whitebark pine (Smith and Fischer 1997). *An Assessment of the Ecosystem Components in the Interior Columbia Basin* (Quigley , 1997) found that disturbances, such as those related to fire and insect mortality, have played an important role in determining forest composition throughout the interior Columbia Basin. In addition to natural disturbance, the Columbia Basin Assessment describes that land management activities and introduced pathogens have dramatically altered the species and age composition of vegetation resulting from a natural disturbance regime.

Northern Idaho, northeastern Washington and western Montana is an island of moisture in the dry interior west. These forests are very productive and produce high levels of organic material. Because these areas generally have more precipitation, wildfire return intervals are longer than in most of the interior west. A recent study (Zack and Morgan 1994) describing fire history within the Coeur d'Alene Basin indicated that an average of once in every 19 years there was a fire season that burned five percent or more of the study area in a single summer. Historically, in an average summer, fires were patchy with variable intensity. During the periodic drought years, however, there were large stand-replacing crown fires that covered tens of thousands of acres. Catastrophic stand replacing fires revisited individual forest stands on an average of once every 150 to 250 years.

In the Newport analysis area, the most significant historic natural disturbance was also fire (New Moon EAWS 1995). Historically, just as was the case in the Priest River subbasin, one third of the landscape in the area would have experienced a stand-replacement fire over a 70 year period, and the majority of the landscape would have experienced a mixed-severity fire (personal communication Art Zack 1999).

Early surveys of the Priest River Forest Reserve report, "One meets with burnt areas everywhere--in the old growth, in the second growth, in the young growth, and where the seedlings that are beginning to cover the deforested area. The burnt tracts are in large blocks, thousands of acres in extent, and in small patches of 15 to 50 acres which extend in all directions through the forest. The burnt areas are scattered all over the reserve, but the largest amount of damage lies within the zone of the white pine. The most extensive plats of burnt forest are found in the northern and western portions of the reserve." (Leiberg, 1898).

In the dry habitat types, the fire return interval is generally moderately frequent, 20 to 100 years (Smith and Fischer, 1997). These fires were frequently low to moderate severity and ranged in size from a few hundred to a few thousand acres (Mutch, 1992). The frequent underburning in these habitat types controlled overstory species composition and density. Fire maintains ponderosa pine throughout its range at the lower elevations and kills ever-invading Douglas-fir and grand fir (Spurr and Barnes, 1980).

In the moist habitat types, the fire return interval is generally longer. Historically, low-severity fires occurred two to three times as often as moderate or high-severity fires (Smith and Fischer, 1997). Many fires burned in a variable pattern depending on weather conditions. In "normal" years, fires may have reached 1 to 1000 acres in size prior to changing weather conditions. These fires burned in a mixed-severity manner, creeping on the ground and jumping into the crowns of dense clumps of trees. During dry years, in combination with a wind event, fires covered large areas, sometimes in the hundreds of thousands of acres. These fires often killed most trees and ground vegetation within the fire perimeter, leaving islands of trees in riparian, wetlands or where recent low-severity fires had removed ladder fuel leading to the upper crowns. This mixture of moderately frequent, mixed-severity fires and infrequent high severity fires created a landscape of large blocks of old and mature forest with smaller areas of variable younger age classes. It also resulted in large blocks of younger forests with smaller areas of mature and old age classes. Because the typical interval between severe fires is generally long in these forest types, the effects of fire exclusion are subtle. However, exclusion of low and mixed severity fires over the past 70 years may lead to reduced ecological diversity and increased homogeneity (stands of similar size, age, species, composition, structure, etc.) across the landscape (Smith and Fischer, 1997).

In the moderate subalpine fir habitat types the fire return interval is fairly long. Most fires in this habitat type were stand replacement events, creating large patches of relatively even-aged stands of trees. Some areas show evidence of underburning and moderate fire severities that maintained a higher proportion of seral species such as larch. Because subalpine fir is very flammable and fire intolerant, mountain meadows were maintained even when the time between fires was of long duration. Small fires sometimes occurred near the ridgetops, burning with variable severities and creating patchy mosaics within the larger even-aged patches (New Moon EAWS 1995).

It is probable that Native Americans used fire to clear camp and travel areas, and create better forage for horses and wildlife. These fires were frequently set, commonly resulting in low-severity fires that covered large areas. At higher elevations topography, fuel moisture and fuel types would influence mixed-severity fire with some creeping underburns and some crowning that would kill small groups of trees. In dry years, fires probably caused mortality over extensive areas.

In the dense forested environments that were more distant from Native American settlements, fires that were a result of lightning were likely most influential in determining vegetation patterns across the landscape.

ROOT DISEASES

Root diseases are natural agents whose ecosystem role has been changed because of human-caused changes in the ecosystem. Currently with the loss of ponderosa pine, western white pine and western larch due to fire suppression, past timber harvests and blister rust, these species are not available to re-establish when root diseases remove Douglas-fir and grand fir. Instead, younger Douglas-fir and grand fir regenerate, leading to cycles of increasing disease severity and declining productivity. Increased amounts of Douglas-fir with persistent root disease also influences higher endemic levels of Douglas-fir beetle that are available to respond to climatic disturbance (Hadfield, 1985; Hadfield and Goheen, 1986;Thies and Sturrock, 1985).

WEATHER

Heavy, wet snows are common in the Pend Oreille Valley. The Pacific air that moves across the Northwest accumulates significant moisture in descending from the Cascade Mountains and across the Columbia Plateau. When this warm/moist air is driven into the Selkirk Mountains, heavy, wet snows can occur. These storms often result in significant windthrow and breakage in species of trees such as Douglas-fir, western hemlock and grand fir, especially when the ground is not frozen. The narrower crowns of western white pine, deep rooting habits of ponderosa pine and the deciduous nature of western larch make them less susceptible to this damage. Root diseases make Douglas-fir especially vulnerable to windthrow.

INSECTS

Recent endemic Douglas-fir beetle distribution and infestation levels in the Newport analysis area have been high. Douglas-fir root disease has expanded in the last decade. Due to high levels of Douglas-fir encroachment from the exclusion of wildfire, blister rust introduction and high-value species logging, recent beetle outbreaks have the potential to expand to very large areas of infestation.

Recent Human Influences

Euro-American settlement began in this area in the late 1800's. Timber harvest is mentioned as early as the 1890s. The National Forest System lands in Newport analysis area were part of the Priest River Forest Reserve, established in 1897. Most of the current private lands were homesteaded or deeded to railroad companies starting around 1905. Many of these lands were cleared for agriculture or logged.

In 1897, John Leiberg of the United States Geological Survey was sent to inspect the reserve. He found evidence that large portions of the reserve had been purposely burned by prospectors, hunters and trappers.

Although Leiberg's report does not cover the Newport part of the Priest River Reserve in 1897, other historic accounts and forest inventories suggest that conditions were similar to that reported by Leiberg for the Priest River Basin and the Sandpoint area.

Forest inventory reports were compiled for the Kaniksu National Forest (of which the Newport Ranger District is a part) in 1927, 1928 and 1958. These early inventories, along with the Forest Type Map for the state of Washington, produced in 1936, reveal trends in species composition and structure similar to those that were recorded by Leiberg.

TIMBER HARVEST

During the early years, the more economically valuable ponderosa pine and western white pine were often logged (high-graded), leaving the shade tolerant species like Douglas-fir, hemlock, grand fir and western redcedar. These species came to dominate the stands -- changing the species composition of the landscape. Sometimes the slash was burned, allowing ponderosa pine to regenerate naturally. Tree planting was only initiated on areas that were severely devoid of trees due to logging and fires. Stands with Douglas-fir understories were not planted. In addition, large trees of most species were logged, reducing the numbers of large trees on the landscape. Multi-storied stands of Douglas-fir, grand fir and western hemlock resulted.

Later timber harvest was mostly regeneration harvest and commercial thinning. The records of timber harvest prior to circa 1950 are sketchy; record keeping on NFS lands improved steadily from about 1950 through the 1970s. About 14% of the landscape has been harvested since 1965 with the majority of the harvest concentrated in the last 10 years. Many stands have had more than one harvest entry, particularly commercial thinning and sanitation/salvage harvests. There have been no fires in recent history that altered stand structure although there have been many small lightning fires (New Moon EAWS, 1995).

Table III-237. Past timber harvest and fires, Newport analysis area (Vegis and Activity Databases, Newport Ranger District).

Timber Harvest and Fire	Approx. Acres	% of NFS Land
Regeneration harvests	4,765	15%
Overstory removal	0	0%
Sanitation and salvage	295	1%
Commercial thinning	2,300	7%
Selection harvest	7	1%
Fires since 1950	604	2%
Total	**7,971**	**26%**

FIRE SUPPRESSION

Fire suppression has largely eliminated the low intensity and small, variable intensity fires from the system. The dry habitat types that would have contained mixed, open stands of ponderosa pine, western larch and Douglas-fir with little understory now have denser tree cover with a higher component of Douglas-fir and grand fir, and understories of dense shrubs or shade tolerant tree reproduction. These drier sites have become more susceptible to stand replacing fires because of multistoried vegetation structures (Agee, 1996). The shift from dominance by seral species to shade tolerant species has made stands much more susceptible to root diseases, dwarf mistletoe, defoliating insects, Douglas-fir beetles and stand-replacing wildfires (Lehmkuhl et al, 1994).

WHITE PINE BLISTER RUST

White pine blister rust was introduced to North America from Europe in the early 1900's. This fungal infection has killed western white pine throughout this region, effectively removing western white pine as a

significant tree species. In many areas, white pine has been replaced by Douglas-fir, grand fir and western hemlock, increasing their dominance in the landscape.

Changes in Species Composition and Cover Type

The previous section described the reasons why species composition has changed. This section will try to quantify the change.

The earliest vegetation survey in the area was conducted by John G. Leiberg, botanist with the Department of the Interior-Geological Survey, between 1897-98. The report resulting from his survey documented the forest conditions as well as general descriptions of the topography, soils, water, and other resources in the Priest River Basin and the area south of the Pend Oreille River. These reports are the earliest documentation of vegetation conditions in the general area of the Newport analysis area. Leiberg mapped the distribution and density of the timber resources.

He separated the area into three general forest zones: white pine, yellow pine, and subalpine; and described the conditions within these zones. Leiberg estimated that the white pine zone composed 80 percent of the basin. "The major tree species within this zone", he stated, "were western white pine and tamarack (western larch), they accounted for 42 and 35 percent of the entire tree growth. The zone of the yellow pine depended on soil and moisture conditions, and overlapped with the white pine zone. The main components of the zone were yellow pine (ponderosa pine), red fir (Douglas-fir), and white fir (grand fir). This zone occupied 10 percent of the basin. The remaining area was the subalpine zone at the higher elevations". Although Leiberg's vegetation classification is different than current systems, it generally would would be described as follows: The rocky, south and west-facing yellow pine phase that Leiberg describes would likely be included in the dry habitat type group and the ponderosa pine cover type. The Douglas-fir dominated sites would likely be included in a portion of the dry and moist habitat type groups and Douglas-fir cover type. The white pine zone would likely be included in the moist habitat type group. The project file contains a map of the habitat type groups and the proposed treatment unit locations.

The Newport analysis area largely is confined to what Leiberg termed the white pine and yellow pine zones, though a small portion of the Pend Oreille-Priest River divide lies in the subalpine zone.

Since Leiberg's report, the forests of the Priest Lake Basin and northern Idaho and eastern Washington have changed dramatically because of fire exclusion and timber harvest. The seral species such as western white pine, larch and ponderosa pine are greatly reduced, while grand fir, Douglas-fir, cedar and western hemlock forest types are currently at higher levels . This change has created stands which are much more fire-intolerant and prone to forest pathogens such as the Douglas-fir beetle.

Table III-238. Comparison of current and historic forest covers on NFS Lands, Newport analysis area.

Forest Cover Types	Historic[2]	Current	Amount of Increase or Decrease
Douglas-fir	9%	26%	+17%
grand fir and western hemlock	8%	15%	+7%
lodgepole pine	<1%	8%	+7%
ponderosa pine	4%	8%	+1%
western redcedar	13%	12%	-1%
subalpine fir, Englemann spruce	7%	3%	-4%
western larch	21%	6%	-15%
western white pine	37%	2%	-35%
conifer/hardwood		5%	
non-forest		15%	
	100%	100%	

From this table it is apparent that major shifts have occurred in forest species composition over the last century. Douglas-fir, grand fir, western hemlock and lodgepole pine have increased. Western white pine and western larch have decreased. Some species (e.g., western redcedar) have remained about the same but their locations have shifted.

Some seral tree species, such as western larch that depends on disturbance and open conditions to regenerate, have been substantially reduced by wildfire suppression and the selective removal of the more valuable species. Conversely, the more shade tolerant Douglas-fir, grand fir and western hemlock have regenerated and persisted under these conditions. Douglas-fir has been very aggressive on the drier sites, invading and dominating without the frequent ground fires and retention of the thick-barked pine and larch. Grand fir, hemlock and redcedar have followed the same encroachment strategy on the more moist sites that historically had significantly higher levels of western white pine and western larch. The western white pine component of the forest has been significantly reduced by logging, white pine blister rust and fire suppression; but blister rust is the primary cause of its decline. The decline of whitebark pine is due to the same wildfire suppression and blister rust introduction. Even though redcedar has been impacted by aggressive logging of stream side areas and wetlands, the encroachment into the areas normally influenced by wildfire has been the major cause of this shift. Subalpine fir has encroached on the higher elevations and cooler sites due to wildfire suppression (New Moon EAWS, 1995).

Changes in Structural Stages

Using the method described in Regional Forester's Amendments 1 and 2, the analysis area was classified by biophysical setting (Kelley, 1998) and the amount of each structural stage that was likely to have ocurred in each biophysical setting before the era of European settlement was estimated . The amount of each structural stage varied over time, and is known as the Historic Range of Variability (HRV). Each stand in each biophysical environment was classified by structural stage. The current conditions were compared with the HRV.

Overall, this landscape is dominated by structural stages 4, 5 and 6 -- all of which are multi-storied. The analysis area is within or above the HRV for structural stage 6, and below for structural stage 7 (structural stage 7 does not occur in biophysical settings 11 and 12). Because this analysis area is deficient in structural stage 7 as compared with the HRV in all biophysical settings, timber harvest would not be allowed in structural stage 6 stands. The following table shows the result of this analysis for each biophysical setting in the analysis area.

2 -- *source USDA 1927, 1928; USDA 1936*

Table III-239. Structural stages by biophysical setting, Newport analysis area.

Biophysical Setting	Stages 1, 2, 3 Early	Stages 4, 5 Middle	Stage 6 Late/Old	Stage 7 Late/Old
#3 - Douglas-fir/Grand fir with tall shrubs				
Current	26%	43%	30%	1%
HRV	10-25	10-25	5-20	30-75
Comparison to HRV	Slightly above	Above	Above	Below
#5 - Douglas-fir/grand fir with huckleberry				
Current	46%	29%	25%	<0.5%
HRV	15-35	20-50	20-30	10-25
Comparison to HRV	Above	Within	Within	Below
#7 - Subalpine fir with forbs and shrubs				
Current	47%	18%	34%	1%
HRV	15-45	35-75	10-30	2-5
Comparison to HRV	Above	Below	Above	Slightly below
#11 - Cedar/hemlock with forbs and shrubs				
Current	30%	41%	29%	0
HRV	10-30	20-50	30-70	NA
Comparison to HRV	Within	Within	Slightly below	NA
#12 - Cedar/hemlock, moist bottom lands				
Current	22%	46%	32%	0
HRV	5-30	10-50	30-90	NA
Comparison to HRV	Within	Within	Within	NA

ENVIRONMENTAL CONSEQUENCES

The findings in this EIS are consistent with the findings of the New Moon Ecosystem Analysis at the Watershed Scale (199); the Integrated Scientific Assessment For Ecosystem Management in the Interior Columbia Basin (1996), Northern Region Assessment (1998) and the Geographical Assessments (in progress) recently conducted in northern Idaho. These assessments recommend converting shade tolerant species to early seral species through regeneration harvests, reducing fire risk through harvest of overstocked stands and making use of natural tree mortality to re-establish early seral species. Major concentrations of natural disturbances (insects, pathogens, weather events, fire) should be used as opportunities for restoration. Treatments in response to natural disturbances would move the ecosystem toward desired conditions, and would not accelerate undesirable trends.

From a vegetation stand point, species composition and stand structure will be used to determine environmental consequences of the alternatives analyzed. Under the No Action alternative, as well as all action alternatives, additional mortality of Douglas-fir is expected to occur over the next two years. The effects of this mortality and alternative actions for treatment are displayed in tables found later in this section. The time frame considered in this analysis was the next two years, however, project-related activities would continue for 5 to 7 years.

Methodology for the vegetation analysis is detailed in the project file.

Effects of Alternative A

Direct and Indirect Effects

Stand structure has been, and will continue to be, affected by the Douglas-fir beetle-caused mortality. The HRV analysis used data collected prior to the beetle outbreak, therefore it's likely that the structural stage percentages will change as the beetle outbreak progresses. Since the beetle targets Douglas-fir in the largest size classes, the most probable effect on structural stage will be to kill the large trees that define LOS stands, returning the stands to structural stage 4 or even 1.

In this alternative there would be no harvest of trees killed by the Douglas-fir beetle. Stands with a high component of large Douglas-fir (greater than 14 inches in diameter) are most susceptible to attack and are likely to lose the greatest number of trees (Lockman and Gibson 1998; Flanagan 1998). Douglas-fir mortality is likely to occur in groups due to the pheromones synthesized by the beetles which attract more beetles to the area. This leads to mass attacks where 60-80% of the large Douglas-fir can be killed. Smaller diameter trees are also often attacked when they occur near these groups, especially in denser stands.

Since Douglas-fir beetle outbreaks typically last 3-4 years in this area and current populations of the beetle are probably at their peak, there is likely to be considerable additional mortality within the next two years. Predictions for projected beetle-caused mortality are based on current levels of beetles within the watersheds, susceptibility of stands to beetle attack, and projected numbers of beetles over the next 2 years. However, the actual severity of future attacks can be greatly influenced by weather. Predicting exactly which stands will attract the beetles is difficult since they are strong fliers and can move several miles. Beetle attacks in 1998 were closely associated with areas that had ice and snow damage in 1996-97, so it would appear that susceptible stands close to existing infestation centers are more likely to be attacked than those further away and are most likely to sustain the greatest mortality. It is estimated that approximately 5,200 acres of National Forest System lands within the analysis area will have some level of Douglas-fir beetle mortality within the next two years.

The Douglas-fir beetle is a major agent of change across this ecozone with stands affected by the beetles having a high probability of species composition change, most often to a climax tree species; and changes in stand structure to a younger age class or a more open canopy. Shifts in stand species composition are expected due to mortality caused by beetles, but these shifts are not expected to appreciably increase the early seral species component. In most stands where over 50% of the basal area is killed by Douglas-fir beetles, the dominant species following the beetle infestation is likely to be grand fir. In the absence of further disturbance these stands are likely to regenerate to Douglas-fir and grand fir so there would be no long-term shift in species composition.

In those stands in which ponderosa pine or western larch are an important component, there would be an improvement in stand condition over the short term as competition between Douglas-fir and these species is reduced. However, there are few stands in this analysis area that have large components of healthy larch and ponderosa pine. In the absence of further disturbance, regeneration of shrubs or shade tolerant Douglas-fir and grand fir is likely to proliferate even in stands with ponderosa pine and western larch. This, in conjuction with high fuel accumulations that would result as the dead Douglas-fir fall to the ground, could lead to higher severity fires that the normally fire-resistant pine and larch may not survive.

The Douglas-fir beetle is expected to cause dramatic changes in structure in some stands. In stands that have a big component of large Douglas-fir, the canopy will be dramatically reduced and the stand will revert to structural stage 1, stand initiation. However, most beetle mortality will occur in small groups scattered throughout a stand. In structural stages 6 and 7 which are defined by the presence of at least 8 large trees (greater than 21" d.b.h.) per acre, the effect of even scattered mortality may be to change the structural stage to 4 or 5. In stands that are multi-storied without the large tree component (SS 4 or 5), the result will be a more open appearance and lower density canopy, but the basic stand structure will be retained. Because

beetles tend to kill trees in groups, it is likely that any holes in the canopy would be small and quickly regenerate with shrubs or shade tolerant species. In most stands, groups of trees killed by Douglas-fir beetles will be less than 5 acres in size, but in some areas beetle-created openings will coalesce with root rot pockets and winter storm damage to create openings up to several hundred acres in size. These larger openings will be irregular in shape and will retain groups of trees and scattered individual trees that have been unaffected by the beetle infestation.

Cumulative Effects

The effects of past actions and other ongoing and reasonably foreseeable harvest and burning projects in the analysis area have been taken into account in the description and analysis of the current condition. A continuation of harvest proposals on federal lands is planned. These reasonably foreseeable actions are listed in Appendix E and were taken into account in the description and analysis of current conditions. These include approximately 3000 acres of salvage and commercial thinning harvest and subsequent burning on some acres. A small amount of road construction and reconstruction are also planned or ongoing. A continued increase in grand fir, cedar, hemlock, and in some situations Douglas-fir, is likely to result from the harvest activities already in progress and planned on National Forest System lands. Competition for light, nutrients and water will be strong in the dense conditions in untreated stands, causing stress and then disturbance. Without continued management to promote western larch, white pine and ponderosa pine, these species will continue to decline in these watersheds and across the Newport District. Depending on the level of disturbance and management, an increase or decrease from current condition of these species may result.

The direct and indirect effects of Alternative A combined with the effects of the ongoing and reasonably foreseeable projects being implemented in the area, will be a modest reduction in fuel loading in the short term. Root disease and other types of bark beetles will continue to cause increasing mortality and fuel buildup in areas that are not treated. Species composition will not change measurably on NFS lands because all of the reasonably forseeable harvest activity is thinning or salvage rather than regeneration harvest.

The effects of Douglas-fir beetle mortality on other ownerships within the analysis area are difficult to ascertain due to a lack of detailed information on current conditions and on how private land owners will treat beetle-killed trees. In very general terms, non-industrial forest owners and industrial forest owners are likely to aggressively harvest dead and dying trees because of their commercial value. Owners of small home sites and recreational property are less likely to harvest their timber. Private landowners that do harvest trees are less likely to invest money in reforestation, so most regeneration is likely to come from natural seeding. Therefore, there would be little change in composition to early seral species. Private lands are less likely to provide old forest structure since harvest is generally driven by economic considerations. Some mature forest is likely to be lost due to beetle mortality. Although it is impossible to predict exactly what will happen on private lands, it's probably safe to say that inherent disturbance regimes and historic ranges of variability in vegetation will never return on a landscape scale.

Effects Common to All Action Alternatives

The assumption used for evaluating the effects of treatment alternatives was that the "new" existing condition would be Alternative A. In all alternatives, we report the effects of changes in the treatment areas as well as the areas not proposed for treatment. We recognize that there may be considerably more change caused by the beetles than we are able to predict, but the effects analysis focuses on those changes that we propose to accomplish with management.

All units were evaluated for potential old growth characteristics. No alternatives propose treatment in any old growth stands, therefore old growth abundance would be unaffected by any action alternative.

Effects Common to Alternatives B, C, D and F

For purposes of this analysis, stands in which less than 40 square feet of basal area remains alive after beetle-caused mortality were classified as structural stage 1, stand reinitiation. Only stands that the beetles (or a combination of beetles and other agents) were predicted to return to structural stage 1 were proposed for regeneration harvest. In other stands, the best we can do is try to decrease stress on the trees remaining alive after the beetle outbreak by thinning from below and salvaging dead trees to decrease fuel loading.

Harvest other than salvage is not proposed in any LOS stands. None of the proposed treatements in any of these action alternatives would change the stand's structural stage from the stage created by the beetle mortality. In some stands, there are enough seral trees in large enough size classes to be able to move the stand toward structural stage 7 with treatment. This would prolong stand life in the current structural stage, even though many of these stands are unlikely to ever reach LOS. All healthy, long-lived seral species (e.g. larch, ponderosa pine, white pine) would be left regardless of size, as would all live 21" d.b.h. and larger trees of any species.

The wildlife standard requires us to preserve corridors by maintaining canopy closure in the upper third of site potential. In many stands in this analysis area, the beetles have already reduced canopy closure below that. We have estimated that 50% crown closure in these biophysical settings is the minimum needed to be in the upper third of site potential. In stands where the beetles have already reduced the canopy closure below that, and they are no longer functional as corridors, some understory thinning may be done in addition to salvage in order to improve stand vigor, reduce fuel loading and either prolong the stand in the current structural stage, or prepare it to move to structural stage 7.

In elk winter range, canopy closure reduction from beetle mortality is threatening to drop forage:cover ratios below Forest Plan standards. For this reason, several treatment units that were proposed for thinning in the draft EIS are now proposed to have salvage only. Clumps of unharvested green and dead trees would be left. While dead trees don't provide canopy closure, they do provide some amount of hiding cover.

The action alternatives preserve short-term options in wildlife habitat and meet the requirements of the Forest Plan. None of these alternatives would change species composition much at the landscape scale, although at the stand level the regeneration harvest stands would move to the desired species composition (dominated by long-lived seral species). This is true even when we combine the effects of the alternatives on the Priest Lake District. Treatment would reduce fuel loading and help to prolong stand life.

These alternatives move some stands (82 acres) toward structual stage 7 by removing some of the fuels (by thinning a portion of the understory trees and salvaging some of the dead trees) and then underburning. This would reduce nutrient and water competition in the larger, fire tolerant trees, and with repeated underburning at appropriate intervals would lead to the development of open, park-like conditions.

Because the green tree removal in these alternatives is primarily thinning from below, the stands are not expected to change structural stage. In the stands proposed for regeneration harvest, removing additional green trees would not change the structural stage since they are already structural stage 1, stand initiation.

At this time there is no known literature evaluating whether Douglas-fir beetle infested timber which has been transported to milling sites has served as a source for spread of beetle activity. Although no literature exists, other species of beetles transported in timber to milling sites have been known to serve as a source for spread of beetle activity. In this Douglas-fir beetle infestation, most trees to be removed would be dead Douglas-fir trees from which the beetles have emerged prior to harvest. This timber would cause no spread of Douglas-fir beetles. A lesser portion of the trees removed would be infested with beetles and larvae at the time of removal and would be transported to mill sites. Prior to the beetle's emergence from the timber, most logs would be processed (i.e. debarked), which would kill the beetle and larvae. If milling is not completed prior to beetle emergence, the possibility of beetle spread exists. Techniques such as water sprinklers set on

log decks, using pheromone attractants in traps and anti-attractants in susceptible stands surrounding mill sites could reduce the chance of beetles leaving the log processing plants.

Effects of Alternatives B and C

Alternatives B and C are exactly the same alternative on the Newport District. Alternative C was developed on the Priest Lake and Coeur d'Alene River Ranger Districts in order to evaluate an alternative that had no road building. Newport Ranger District is not proposing any road building in any alternative.

Direct and Indirect: Regeneration harvest would range from five to approximately 80 acres in size, depending on the extent of Douglas-fir beetle-caused mortality and existing root disease and storm damage. These openings would retain groups of trees and scattered individual trees that have been unaffected by the beetle infestation.

Approximately 29 acres would achieve the desired species composition through timber harvest and associated planting. These stands are also more likely to provide the desired long-term forest structure since the planted species are more resistant to root disease. Of the selective harvest shown in the table in Chapter II, 1,250 acres would be treated with a salvage harvest and 242 acres would be treated with thinning. These harvests would not improve species composition, but would reduce fuel loading and would move 82 acres toward structural stage 7.

Cumulative: Refer to Alternative A cumulative effects discussion for the effects of foreseeable actions on NFS lands and other ownerships. Because the effects of past, ongoing and reasonably foreseeable actions has been taken into account in the description and analysis of current condition, the cumulative effects of those and this alternative are the same as the direct and indirect effects.

Effects of Alternative D

Direct and Indirect: If beetle mortality is as projected and all units are treated as analyzed, approximately 162 acres would achieve the desired species composition through timber harvest and associated planting. These stands are also more likely to provide the desired long-term forest structure since the planted species are more resistant to root disease. Of the selective harvest shown in the table in Chapter II, 4,164 acres would be treated with a salvage harvest and 437 acres would be treated with thinning. These harvests would not improve species composition, but would reduce fuel loading and would move 82 acres toward structural stage 7.

Cumulative: Refer to Alternative A cumulative effects discussion for the effects of foreseeable actions on NFS lands and other ownerships. Because the effects of past, ongoing and reasonably foreseeable actions has been taken into account in the description and analysis of current condition, the cumulative effects of those and this alternative are the same as the direct and indirect effects.

Effects of Alternative E

Direct and Indirect: Approximately 29 acres would achieve the desired species composition through timber harvest and associated planting. These stands are also more likely to provide the desired long-term forest structure since the planted species are more resistant to root disease. Of the selective harvest shown in the table in Chapter II, all 1,492 acres would be treated with a salvage harvest. These harvests would not improve species composition, but would reduce fuel loading. No stands would be moved toward structural stage 7.

Cumulative: Refer to Alternative A cumulative effects discussion for the effects of foreseeable actions on NFS lands and other ownerships. Because the effects of past, ongoing and reasonably foreseeable actions has been taken into account in the description and analysis of current condition, the cumulative effects of those and this alternative are the same as the direct and indirect effects.

Effects of Alternative F

Direct and Indirect: Approximately 133 acres would achieve the desired species composition through timber harvest and associated planting. These stands are also more likely to provide the desired long-term forest structure since the planted species are more resistant to root disease. Of the selective harvest shown in the table in Chapter II, 3,046 acres would be treated with a salvage harvest and 206 acres would be treated with thinning. These harvests would not improve species composition, but would reduce fuel loading and would move 82 acres toward structural stage 7. Only units that are adjacent to private land or would be likely to allow fire spread to private lands would be treated.

Cumulative: Refer to Alternative A cumulative effects discussion for the effects of foreseeable actions on NFS lands and other ownerships. Because the effects of past, ongoing and reasonably foreseeable actions has been taken into account in the description and analysis of current condition, the cumulative effects of those and this alternative are the same as the direct and indirect effects.

Effects of Alternative G

Direct and Indirect: While the screens apply only to timber sales, not to prescribed burning, this alternative does not meet the ***intent*** of the screens. This alternative would create approximately 99 acres of structural stage 1. When combined with the acres that beetle mortality alone would move to SS 1, there are approximately 199 acres that could eventually move toward desired species composition if planting is feasible. Through a combination of falling and lopping trees and underburning in stages, 82 acres would be moved toward structural stage 7. This alternative is less certain in its effects than the alternatives that use harvest.

Cumulative: Refer to Alternative A cumulative effects discussion for the effects of foreseeable actions on NFS lands and other ownerships. Because the effects of past, ongoing and reasonably foreseeable actions has been taken into account in the description and analysis of current condition, the cumulative effects of those and this alternative are the same as the direct and indirect effects.

Table III-240. Changes to structural stages under each alternative, Newport Analysis Area.

	Existing		No Action		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
	Acres	%[1]	Acres[2]	%[1]	Acres	%[1]	Acres	%[1]	Acres	%[1]	Acres	%[1]	Acres	%[1]	Acres	%[1]
Structural Stage[3]																
Early (SS 1, 2, 3)	9288	30	9317-9487	30-30.6	9317	30	9317		9450	30.5	9317		9421	30.4	9487	30.6
Middle (SS 4 and 5)	12384	40	12384	40	12384	40	12384	40	12384	40	12384	40	12384	40	12384	40
Late/Old (SS 6)	8979	29	8780-8950	28.4-29	8950	29	8950		8817	28.5	8950		8846	28.6	8780	28.4
Late/Old (SS 7)	310	1	310	1	310	1	310	1	310	1	310	1	310	1	310	1
Moved toward SS 7			0		82	.03	82	.03	82	.03	0	0	82	.03	82	.03
Cover Type																
Douglas-fir	8050	26	6582	21	6768	22	6768	22	6723	22	6582	21	6687	22	6483	21
Western Hemlock	619	2	619	2	619	2	619	2	619	2	619	2	619	2	619	2
Grand fir	4025	13	4614	15	4614	15	4614	15	4562	15	4614	15	4562	15	4614	15
Ponderosa Pine	2477	8	2477	8	2477	8	2477	8	2610	8	2477	8	2610	8	2576	8
Western Redcedar	3715	12	4076	13	4076	13	4076	13	4040	13	4076	13	4076	13	4076	13
Subalpine Fir	929	3	929	3	929	3	929	3	929	3	929	3	929	3	929	3
Western Larch	1858	6	1887	6	1887	6	1887	6	1887	6	1887	6	1887	6	1887	6
Lodgepole Pine	2477	8	2966	10	2780	9	2780	9	2780	9	2966	10	2780	9	2966	10
Western White Pine	619	2	619	2	619	2	619	2	619	2	619	2	619	2	619	2
Hardwood/con-ifer	1548	5	1548	5	1548	5	1548	5	1548	5	1548	5	1548	5	1548	5
Non-Forest	4644	15	4644	15	4644	15	4644	15	4644	15	4644	15	4644	15	4644	15

1 Percentage represents the percent of National Forest System land affected.
2 None of the action alternatives are expected to reduce bark beetle infestation levels so the information supplied for the No Action Alternative will be the same for all Alternatives.
3 Structural stage would not change from the No Action in any action alternative except for Alt. G

Effects of Opportunities

Timber Stand Improvement Projects (Precommercial thinning): Thinning redistributes growth and changes stand species composition for the future. Thinning would favor healthy trees of desired species adapted to the various habitat types. The seral species of ponderosa pine, western larch and white pine would be favored when present on the appropriate growing sites. The effect of this thinning would be to move toward stocking levels which would allow for continued tree growth, by favoring the healthiest trees to remain on site and allowing for nutrients critical to the tree's growth and defense mechanisms to be redistributed to uncut trees. Healthy, growing trees that are adaptable to disturbance on these sites would reduce the risk of epidemic levels of insect and disease infection, and allow managers a variety of options for future vegetation management.

Under all alternatives the mortality levels and acres of mortality which would occur are not expected to change substantially between the No Action and any action alternative. Under all action alternatives the stand structures would not change as compared to the No Action alternative.

Watershed Restoration Projects: Road obliteration would make access to some areas for vegetation manipulation more difficult. It could also reduce the amount of noxious weed spread which would have a beneficial effect on native vegetation.

Consistency with the Forest Plan, National Forest Management Act, and Forest and Rangeland Renewable Resources Planning Act

Consistency with the Forest Plan: All action alternatives meet Forest Plan Standards and standards established by Regional Forester's Amendment Nos. 1 and 2. No harvest is proposed in late or old structure stands or mapped old-growth. No live trees greater than 21-inches d.b.h. would be cut, except as necessary for safety or to facilitate logging systems. Regeneration is only proposed in stands where the majority of the trees have been killed by the beetle.

Stands proposed for regeneration are those in which the beetle mortality has already returned them to structural stage 1 (stand initiation). Regeneration harvest merely reduces fuel loading by salvaging dead trees and treating slash, and removes some remaining suppressed trees in order to replant with seral species. No stands would be returned to an earlier seral stage as a result of the proposed treatments.

Consistency with the NFMA and RPA: This project includes 2 openings greater than 40 acres. The Douglas-fir beetle have killed so many trees in these areas that the openings have been created by the insects. The Forest Silviculturist reviewed the proposal and discussed this proposal with the Regional Silviculturist. A letter signed by Robert Vaught, Colville Forest Supervisor, and available in the project file explains this decision. Therefore the Regional Forester's approval was not necessary and was not sought.

Areas proposed for thinning (green tree removal) were reviewed for suitability. All areas of green tree removal are suitable. Removal of dead trees (salvage) is allowed on unsuitable ground. The suitability determination includes the determination that all regeneration harvested lands are capable of being restocked within 5 years.

Even aged silvicultural systems proposed (shelterwood, seedtree) are appropriate to meet the objectives and requirements of the Forest Plan. No other silvicultural regeneration system was feasible in the units proposed for regeneration because beetle-caused and other mortality had already reduced tree numbers so drastically that uneven aged regeneration systems were not possible.

THREATENED, ENDANGERED AND SENSITIVE PLANTS

CHANGES BETWEEN THE DRAFT AND FINAL EIS

Some changes have occurred between the Draft and Final EIS. An eleventh-hour signing of the new Sensitive Species list by the R6 Regional Forester (May 13, 1999) prompted a change in wording to reflect that. Previously, we had stated that the new list would not be signed before the decision on this project. We instead addressed species on both the 1990 list and the draft 1998 list. Consequently, some species addressed herein have been dropped from the list. We noted that, but decided not to rewrite the evaluation.

The other major change has occurred in the GIS coverage used to identify suitable sensitive plant habitat. The coverage used for the Final EIS is more complete than that used for the DEIS, so that there are no longer any proposed treatment acres without sufficient data for assignment to a rare plant habitat guild. Acreages of occurrence of the different habitat guilds have also changed from use of the updated plant habitat association coverage.

Harvest prescriptions and acreages proposed for harvest have also changed since the Draft EIS. These changes are insignificant in relation to effects on sensitive plant species, and did not result in any changes in determination of effects.

Alternatives F and G have been added since the Draft EIS; their direct, indirect and cumulative effects to sensitive plants are addressed in the Final EIS.

REGULATORY FRAMEWORK

Federal legislation, regulations, policy and direction require the protection of species and population viability and the planning process consideration of Threatened, Endangered and other rare (Forest Service Sensitive) species. The regulatory framework for TES plants includes the Endangered Species Act (1973) as amended, the National Forest Management Act (NFMA) (1976), the National Environmental Policy Act (1969), Forest Service Manual (FSM 2672.1-2672.43), the Colville National Forest Plan (1988), and direction from the Washington Office.

There are no Federally listed Endangered or Threatened plant species known or suspected to occur in the Newport planning area.

Sensitive species, as determined by the Regional Forester, are those species for which population viability is a concern, as indicated by a downward trend in population numbers or habitat capability which would reduce the species' existing distribution.

Sensitive species lists are developed in conjunction with state natural heritage programs. Washington Natural Heritage Program (WHP) lists 47 vascular plant species thought to be rare in the three northeastern counties encompassed by the Colville National Forest (CNF). Forty sensitive species designated in 1990 by the Pacific Northwest Regional Forester for the CNF are known or suspected to occur in the Newport Ranger District. A revised list, containing 32 known or suspected species for the district, was proposed in 1998 and was signed on March 13, 1999. Since the new list was not expected to be signed before a decision was issued for this analysis, effects to species on both lists were addressed. Regional direction provided that, for projects initiated prior to the signing of the new list, but without a signed decision, the old list, the new list or a combination of both lists could be addressed (Williams 1999). The list of designated (1990) and proposed (1998) sensitive species applicable to the district is included in Appendix B. The new (1999) sensitive species list is also included in Appendix B. Two species on the new list were not specifically addressed, as they were

neither on the 1990 list nor the draft 1998 list. *Cypripedium parviflorum* and *Carex comosa* are peatland species suspected to occur in Pend Oreille County; peatland guild habitat in which these species could occur was addressed in the analysis.

AFFECTED ENVIRONMENT

Assessment of sensitive plant and suitable habitat occurrence was accomplished through review of Newport Ranger District sensitive plant records, WHP Element Occurrence Records, National Wetlands Inventory maps, previous sensitive plant surveys, personal knowledge and professional judgement of the IPNF North Zone Botanist, Newport Ranger District Ecologist and CNF Botanist.

Sensitive plants may be assigned to one or more rare plant guilds. These guilds are artificial assemblages based on similar habitat requirements of two or more rare plant species, and are used for analysis. Most known and suspected sensitive plants on the Colville National Forest occur in the peatland, wet forest, moist forest, dry forest, cold forest and subalpine habitat guilds. Within these guilds, microsites such as small rock seeps and springs can support certain sensitive plants; these microsites are not identifiable at a coarse scale. Larger rock cliffs, which may also support sensitive plant species, are often visible on aerial photographs, or can be inferred from topographical maps. See Appendix B for specific guild descriptions.

Previous Sensitive Plant Surveys

Previous sensitive plant surveys were conducted in 1996 in the northern portion of the project area, for the New Moon Environmental Assessment (1997). Vegetation information used for this analysis is derived from the results of those surveys, documented sensitive plants occurrences (WHP 1998), coarse plant association queries and informal observations by Forest Service personnel during field sampling for development of the proposed action.

No sensitive plant surveys have been conducted to date specifically for this analysis. Surveys of highly suitable habitat and appropriate protection measures to protect sensitive plant populations are required prior to project implementation (see Chapter II).

Documented Sensitive Plant Occurrences

A total of eight occurrences of two sensitive plant species are known in the Newport project area (see table B-5 in Appendix B). One species occurs in both moist and dry forest habitat, while the other is found in wet forest habitat. The known occurrences are as follows:

Pine broomrape (*Orobanche pinorum*) is a parasitic plant of the family Orobanchaceae; it lacks chlorophyll, and grows in close association with and parasitizes the roots of oceanspray (*Holodiscus discolor*). Oceanspray is a widely occurring shrub found in wet, moist and dry forest habitats and from low to middle elevations. There are six documented occurrences of pine broomrape in dry forest habitat within the project area and one within moist forest habitat. One occurrence is in "open coniferous forest in a state of regeneration" (WHP 1998). Much of the proposed harvest and project-related activities would occur in suitable habitat for this species.

Occurrence of this species in disturbed as well as undisturbed sites indicates a tolerance for some variability in habitat conditions. Its host plant, oceanspray, is well-adapted to disturbance by fire (Crane and Fisher 1986). While individual occurrences of pine broomrape could be vulnerable to ground-based timber harvest, helicopter landings, prescribed fire and wildfire, the species is considered to be more secure than previously thought. Due to its relative abundance, tolerance of disturbance and apparent lack of threats to species viability, pine broomrape was proposed for delisting in the draft (1998) sensitive species list for the Colville National Forest; it was subsequently dropped from the 1999 list.

Dainty moonwort (*Botrychium crenulatum*), a primitive fern-like plant of the family Ophioglossaceae, is apparently somewhat dependent on dense canopy cover and moist soil conditions. Mycorrhizal relationships are likely also critical to its survival. One occurrence of this species is documented in mature wet forest habitat in the project area, within the riparian influence of a stream. Recent Douglas-fir beetle activity in its habitat was generally scattered, and no harvest or project-related activities are proposed in or near this documented occurrence.

Sensitive Plant Habitat Guild Occurrence

Analysis of habitats within the project area was conducted to determine the distribution of potentially suitable sensitive plant habitat by guild. Site-specific information from timber stand examination records, National Wetlands Inventory (NWI) maps, aerial photos, topographic position, existing habitat and survey information, personal knowledge and professional judgement were considered in the identification of highly suitable habitat within each rare plant guild. The table below summarizes the extent of suitable habitat, by alternative, within the Newport project area. Acres of suitable habitat in Alternatives B-G are proposed for harvest or project-related activities and are a subset of acres in Alternative A, which have been affected by recent beetle activity. Road miles (shown in parentheses) are those proposed for obliteration.

Table III-241. Suitable sensitive plant habitat, by alternative - Newport analysis area.

Sensitive Plant Guild	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Wet Forest Guild	54 (0)	18 (0.16)	18 (0.16)	47 (0.53)	18 (0.16)	26 (0.53)	19 (0.53)
Moist Forest Guild	2,256 (0)	778 (3.83)	778 (3.83)	2,070 (6.72)	778 (3.83)	1,424 (4.86)	1,050 (5.10)
Dry Forest Guild	2,860 (0)	709 (4.90)	709 (4.90)	2,548 (6.65)	709 (4.90)	1,925 (3.40)	1,667 (3.77)
Aquatic Guild	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Peatland Guild	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cold Forest Guild	19 (0)	14 (0)	14 (0)	19 (0)	14 (0)	7 (0)	0 (0)
Subalpine Guild	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total Acres/(Miles)	**5,189 (0)**	**1,519 (8.89)**	**1,519 (8.89)**	**4,684 (13.9)**	**1,519 (8.89)**	**3,382 (8.79)**	**2,736 (9.4)**

Aquatic, deciduous riparian, peatland and **subalpine forest** guild habitats within the project area generally experienced little or no recent beetle activity. No harvest or project-related activities are proposed in habitats within these guilds.

A small amount of **wet forest** guild habitat (54 acres) has been affected by the recent Douglas-fir beetle attack. Harvest and/or project-related activities are proposed in this habitat under one alternative (please refer to the table above). The majority of recent beetle activity occurred in the **moist** and **dry forest guilds**. Harvest and/or project-related activities are proposed in this guild in all action alternatives.

The **moist** and **wet forest** guilds could support other sensitive species as well as the documented occurrences of pine broomrape and dainty moonwort. **Ground pine** (*Lycopodium dendroideum*), **black snakeroot** (*Sanicula marilandica*), and other rare **moonworts** (*Botrychium minganense, B. montanum, B. lanceolatum, B. lunaria* and *B.*

pinnatum) could occur within the project area. While none of these species has been found in the analysis area, most of them occur near there in the adjoining Priest Lake Ranger District.

Long-term studies, recent population monitoring and informal observation indicate that sensitive species occurring in these guilds exhibit varying degrees of tolerance to disturbance of soil, vegetation and/or canopy cover. Previous harvest activity in the Priest Lake Ranger District within known occurrences of ground pine appeared to damage plants in landing areas and skid trails, while winter logging with snow cover minimized ground disturbance and impacts in most of the population (Penny 1996). Low-intensity fire usually kills ground pine plants and destroys rhizomes in the litter layer, while rhizomes deeper in the soil persist to recolonize as early as the fifth growing month following fire (Williams 1990). By contrast, stand-replacing fire could destroy even deeply-rooted rhizomes.

Black snakeroot appears to tolerate moderate levels of soil disturbance and canopy reduction. Flowering and fruiting appear to occur more frequently as canopy openings increase.

Current and future threats to sensitive moonworts include activities or events which would destroy the plants, underground rhizomes or soil mycorrhizae, or which would significantly reduce canopy cover in the plants' habitat. Such events and activities include ground based timber harvest and fuels treatment, canopy reduction to below about 75 percent, trampling and browsing by wildlife, wildfire and prescribed underburning. The above five moonwort species were proposed for removal from the draft sensitive species list (1998); because of lack of identifiable threats, abundant population numbers, or lack of historical or current occurrences they were not included in the 1999 list.

Dry forest guild habitats in the project area could support several plant species listed or proposed for listing as sensitive for the Colville National Forest. Most sensitive species that occur in these habitats are adapted to specific microsites such as talus rock, limestone cliffs, rock breaks above rivers and streams, open gravelly slopes and dry, grassy meadows. Approximately 2,860 acres of dry forest habitat, some of which may contain microsites suitable to support sensitive plant species, were affected by recent beetle activity.

There are no current threats to the specialized microsites of this guild which could support sensitive plant species. However, activities or events which would disrupt native vegetation and/or result in soil disturbance could render these microsites (dry meadows in particular) susceptible to invasion by noxious and undesirable weeds. Ground-based timber harvest, helicopter landings, prescribed fire and wildfire could pose a threat to open slopes and dry meadows, while rock breaks and cliffs are generally protected form human-caused disturbance by their inaccessibility.

The remainder of beetle-affected areas have low potential to support sensitive plant species of any habitat guild.

ENVIRONMENTAL CONSEQUENCES

Methodology

No ground-disturbing activities would take place before the necessary surveys are completed. See Appendix D and the discussion of surveys at the end of this section.

Analysis was conducted using results of previous TES plant surveys, current distribution and condition of sensitive plant species in habitats similar to those found in the proposed treatment sites, current knowledge of the ecology of sensitive species known or suspected within the analysis area, and professional judgement. The extent of habitat alteration from the recent Douglas-fir beetle infestation, and the types of proposed harvest and project-related activities were considered in evaluating the effects to documented occurrences

and/or suitable habitat for each alternative. Presence of sensitive plant species is presumed in unsurveyed, highly suitable habitat.

While a high number of acres have been identified as containing highly suitable habitat, based on past sensitive plant surveys, only a very small percentage of suitable habitat is likely actually occupied. Even with the presence of abundant suitable habitat, because the plant species addressed in this analysis are rare, most suitable habitat is unoccupied.

The cumulative effects area was determined to be the Newport analysis area.

Effects to sensitive plant species or suitable habitat from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

> ***very low*** *= no measurable effect on individuals, populations or habitat*
> ***low*** *= individuals and/or habitat not likely affected*
> ***moderate*** *= individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support sensitive plant species*
> ***high*** *= populations would likely be affected and/or habitat capability may over the long term be reduced below a level which could support sensitive plant species*

Effects to population viability from disturbance events (natural or human-caused) are difficult to quantify with certainty for all sensitive plant species. Specific knowledge of population biology and autecology is lacking for several species addressed in this analysis, particularly the sensitive moonworts (*Botrychium* species). Much of the current knowledge regarding sensitive plant species is based on informal observation (non-empirical) and even anecdotal information. Long-term studies of peatland species and their habitats (Rumely 1956, Bursik and Moseley 1992 and Bursik and Moseley 1995) and recent monitoring of groundpine (Penny 1996) provide a greater understanding of the relationship of disturbance to viability of these species.

Indicators used to measure effects on sensitive plants and suitable habitat include the predicted reduction in canopy cover from the recent Douglas-fir beetle infestation and different harvest treatments, the amount of each proposed activity, the extent of ground disturbance, proximity of known sensitive plant occurrences and suitable habitat to proposed activities and the predicted reduction of heavy fuel loads. The following table provides an assessment, based on the best available information, of the risk to sensitive plants in the analysis area from certain types of disturbance.

Table III-242. Summary of risk by Rare Plant Guild for highly suitable habitat from disturbance (human-caused and natural).

Proposed Activity or Event	Sensitive Plant Guild Potentially Affected	Risk of Adverse Impacts to Sensitive Plant Occurrences (without mitigation)
Loss of < 50% canopy cover due to insects or disease	Moist Forest / Wet Forest Dry Forest	Moderate Low - Moderate
Loss of > 50% canopy cover due to insects or disease	Moist Forest / Wet Forest Dry Forest	High Moderate
Regeneration harvest including site preparation	Moist Forest / Dry Forest	High
Commercial thinning and salvage using ground based equipment	Moist Forest / Wet Forest Dry Forest	High Moderate - High
Helicopter and roadside salvage	Moist Forest / Dry Forest / Cold Forest	Low
Full road obliteration	Wet Forest / Moist Forest / Dry Forest	High
New road construction	Wet Forest / Moist Forest / Dry Forest / Peatland	High
Road reconstruction/reconditioning	Wet Forest / Moist Forest / Dry Forest	Low
Channel crossing removal (culverts)	Wet Forest / Moist Forest	Low - Moderate
Road closure, ripping, seeding	All	Low
In-stream fisheries / watershed restoration (structure placement w/ equipment)	Deciduous Riparian / Wet Forest / Peatland	High
Fuel reduction by underburning	Moist Forest / Wet Forest Dry Forest	Moderate - High Low - Moderate[1]
Fuel reduction - mechanical	Moist Forest / Dry Forest	Moderate - High
Noxious weed prevention and treatment	Dry Forest / Moist Forest	Low - Moderate
Stand-replacing wildfire	Moist Forest / Dry Forest	Moderate - High

Without mitigation, there exists a high likelihood of adverse effects to sensitive plants in highly suitable habitat, especially from moderate to high risk activities such as regeneration harvest, commercial thinning using reactor or skyline methods, road construction, fuel break construction, full road obliteration (return to contour), and fuels reduction (underburning and mechanical treatment). Adverse effects could lead to loss of population viability or a trend toward federal listing, especially for sensitive plant species in the moist and wet forest guilds.

For other species, moderate to low risk activities such as salvage, low-intensity fire and road reconstruction are not likely to adversely affect population viability; however, individual plants my be affected. Observations and species ecology indicate that some activities may have little effect, or even a positive effect, on some sensitive plant species. Black snakeroot appears to respond to canopy opening by increased flowering and fruiting and to ground disturbance by colonizing exposed mineral soils. The host plant of the

[1] *Some dry forest sensitive plant species may be dependent on periodic low levels of disturbance from fire, such as that which occurred historically in some dry forest habitats. For example, the parasitic pine broomrape (Orobanche pinorum) may be adapted to periodic low-intensity fire, since its host plant, oceanspray (Holodiscus discolor) occurs in habitats which historically were subjected to those natural disturbances (Crane and Fischer 1986). The timing of an underburn relative to soil moisture in suitable habitat and the flowering and fruiting of the plant species of concern also influences potential effects.*

parasitic pine broomrape, oceanspray, occurs in a broad range of habitats and has demonstrated tolerance of moderate levels of disturbance (Crane and Fisher 1986). Pine broomrape has been documented in the project area in previously disturbed habitats (WHP 1998).

Protection of large occurrences within a population is assumed to be an effective conservation strategy. Loss of scattered individuals on the periphery of or isolated from the main population generally does not threaten populations.

Timber Harvest Methods

Selective harvest only (exclusive of fuels treatment): For dry forest, moist forest and non-riparian wet forest guilds in which removal of beetle-killed trees only would occur, there may be incidental impacts to individuals of some sensitive plant species. The species most likely to incur incidental impacts to individuals include sensitive moonworts (*Botrychium* species) and pine broomrape (*Orobanche pinorum*). This type of harvest would not reduce canopy cover significantly below what has already occurred from bark beetle mortality.

Regeneration harvest is proposed only where less than 40 square feet of basal area remains following beetle-caused mortality. For moist forest and non-riparian wet forest guilds in which regeneration harvest using ground-based systems would occur, impacts related to canopy removal would in many cases not be significantly different from that under the No Action alternative. These areas generally have a high percentage of Douglas-fir overstory and very heavy beetle mortality (80-90 percent in some cases), and removal of green trees may contribute to 15 percent or less of additional canopy reduction. In other cases, up to 30 percent additional canopy removal would occur, and potential impacts from canopy reduction would differ from those of the No Action alternative. The likeliest adverse effects expected would be to species intolerant of open canopy conditions and those dependent on soil mycorrhizal relationships (**moonworts**). The extent of adverse impacts on these sensitive species would depend on the combination of proposed harvest system (ground-based being the most detrimental) and fuels treatment (grapple piling[2] or burning being the most detrimental compared to yarding of tops).

Timber Yarding Systems

Helicopter yarding would have insignificant impacts on sensitive plant species and suitable habitat, as ground disturbance would be minimal. In areas proposed for ***skyline yarding***, ground disturbance would be largely confined to long, narrow corridors; canopy cover would be virtually 0% in these corridors. With skyline systems, there is usually some flexibility in the designation of corridors, so that microsites of highly suitable habitat can often be buffered from their effects. ***Tractor yarding*** generally produces the most detrimental and long-term impacts to TES plants and habitats, mainly from soil compaction and ground disturbance. Impacts are usually confined to designated skid trails, and there is some flexibility in skid trail location so that microsites of highly suitable habitat can often be avoided.

Winter logging (usually both felling and yarding) reduces effects to sensitive plants to those associated with canopy removal, since ground disturbance would be minimal.

Fuels Treatment

Various methods of fuels reduction are proposed under action alternatives, all having the potential to impact sensitive plants. Slashing, yarding tops and lop and scatter fuels treatments would have a negligible effect on sensitive plant species. Underburning and grapple piling have the greatest potential for impacts to sensitive plants and suitable habitat, as they cause the most ground and/or vegetation disturbance.

[2]*No grapple piling is proposed in the Newport project area.*

Fireline and various types of fuelbreak construction also have the potential to impact sensitive plants and habitat through vegetation and ground disturbance. Features for TES Plants (Chapter II) would protect populations and highly suitable habitat that may be discovered during field surveys prior to project implementation. There would be a risk of increasing certain noxious weed species with burning, depending on the proximity to existing infestations and the cover type of the area treated (refer to Chapter III, Noxious Weeds).

Road Work

Road reconstruction and ***reconditioning*** are low risk activities in terms of direct or indirect impacts to sensitive plants and habitat. These activities occur on existing road prisms which have already been disturbed and are generally of very low habitat suitability.

Sensitive plants in the wet forest guild could be impacted by the ***removal*** or ***replacement of culverts*** at stream crossings. Site-specific surveys would be conducted prior to implementation of any such projects. Isolated or undetected individuals of some species may be impacted.

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

For sensitive plants direct, indirect and cumulative effects were not addressed at the analysis area level. All effects were addressed at the project area level.

Direct, Indirect and Cumulative Effects at the Newport Project Area Scale

Effects Common To All Alternatives

Direct and Indirect Effects

Any impacts to individuals of **pine broomrape** (*Orobanche pinorum*), **triangle moonwort** (*Botrychium lanceolatum*), **mingan moonwort** (*B. minganense*), **western goblin** (*B. montanum*), **northwestern moonwort** (*B. pinnatum*), **common moonwort** (*B. lunaria*), **northern twayblade** (*Listera borealis*) or **northern gooseberry** (*Ribes oxycanthoides* spp. *cognatum* and spp. *irriguum*) would not threaten population or species viability. Because of lack of identifiable threats, abundant populations, or because there are no known historical or current occurrences, these species were proposed for delisting in 1998 and were dropped from the new Regional Forester's Sensitive Species list in May, 1999.

Cumulative Effects

Cumulative impacts resulting from recent Douglas-fir beetle activity in moist forest habitat could include high-intensity, duff-replacing wildfires from predicted high fuel loading in untreated areas. Such a fire, if it were to occur, would be detrimental to obligate mycorrhizal species such as the moonworts. Populations of groundpine could be destroyed if such a fire were intense enough to burn deeply-rooted rhizomes. The prospect of recolonization of affected habitat by any of these species would depend on the extent and duration of habitat alteration and the availability of an adjacent seed source. Cumulative impacts to these species related to stand-replacing wildfire would be predicted to be low to moderate.

While sensitive plant occurrences identified on federal lands are managed to maintain population and species viability, adjacent State and private landowners are not required to protect these species. Therefore, loss of populations and modification of habitat for some sensitive species on those lands has likely occurred and may continue. A low level of cumulative effects from activities on lands under other ownership is likely for at least some sensitive plant species.

Effects Common To All Action Alternatives

Direct and Indirect Effects

No currently documented occurrences of any sensitive plant species would be directly or indirectly impacted by implementation of any action alternative.

No harvest or project-related activities are proposed within **deciduous riparian** or **aquatic** habitats in the project area. Based on the location of proposed activities and professional judgement, no deciduous riparian or aquatic habitat able to support any TES plant species would be impacted by implementation of any of the action alternatives; there would be no direct or indirect impacts to any sensitive species occurring in these guilds.

Peatland habitats may be present in the project area. Buffering these habitats as proposed (see Chapter II) would eliminate the risk of sediment or nutrient delivery or hydrological change to these habitats from proposed activities. There would be no direct or indirect impact to any sensitive species or suitable habitat within this guild from implementation of any action alternative.

Subalpine habitats in the project area are not proposed for harvest or project-related activities in any of the action alternatives. There would be no direct or indirect impact to members of this guild.

Timber harvest in **wet forest** guild habitats within riparian areas would not occur under any action alternative. There would be no direct or indirect impact from timber harvest as proposed on any sensitive species occurring in riparian habitats of this guild. Refer to the analysis of project-related activities for potential impacts to this guild from those activities.

Under all action alternatives, incidental direct impacts to undetected individuals of sensitive **moonworts** (*Botrychium* species) may occur where activities would occur in **wet forest** or **moist forest** habitats. Because of their small stature and unpredictable appearance of above-ground stalks, individual moonworts could go undetected even during a thorough survey. Most highly suitable habitat for sensitive moonworts in the wet forest guild would be buffered from harvest or project-related activities. However, sensitive moonworts have a broader habitat range than most other sensitive plant species, and isolated occurrences in moist forest habitat and such unlikely sites as road turnouts could be impacted.

Open meadow microsites that could support two species of **moonwort** (*Botrychium campestre* and *B. hesperium*) are not proposed for any harvest or project-related activities. No direct or indirect impacts are expected to occur to habitat for these species.

Black snakeroot, while not known to occur within the project area, has been found in shaded habitats within the Newport Ranger District (WHP 1998). In the adjacent Priest Lake Ranger District in northern Idaho, the species has been found to readily colonize disturbed habitat, and canopy openings were found to promote flowering and fruiting (ICDC 1998). A similar response to low to moderate levels of disturbance could be expected in the Newport populations.

There could be a risk of prescribed fire escaping to impact individual sensitive plants and suitable riparian, wet forest and moist forest guilds and grassy meadow microsites which were buffered from harvest activity. The extent of risk would depend on many factors, including timing of the burn, phenology of the plant species involved and occurrence of abnormally wet or droughty conditions in suitable habitat at the time of the burn. Based on the best available knowledge and the location of proposed underburn units to known sensitive plants and highly suitable habitat, the risk of direct or indirect impacts from escaped fire under any action alternative would be low.

Cumulative Effects

No cumulative impacts to sensitive species or suitable habitat in **aquatic, deciduous riparian, peatland, subalpine** or **cold forest** guilds are expected from implementation of any of the action alternatives.

There would be no cumulative impacts to most documented **moist forest** and **wet forest** TES plant occurrences within the project area. Cumulative impacts to all members of the genus *Botrychium* would be expected to be low. No cumulative impacts to **black snakeroot** would be expected, and cumulative impacts to **wet forest** habitat in general would be low.

Any incidental impacts to sensitive moist forest, wet forest and dry forest guild species or habitat would not cause a loss of population or species viability or lead to a trend to federal listing.

Alternative A

Direct and Indirect Effects

Predicted results from the recent beetle infestation include changes in forest canopy cover and wildfires of high intensity from heavy fuel loads. There has been little to no recent beetle activity in any known sensitive plant occurrences. Discussion of impacts from recent beetle activity alone thus focuses on impacts to potentially occurring undocumented sensitive plant species and suitable habitat.

Formal study of **groundpine** populations in the adjacent Priest Lake Ranger District (IPNF) indicate that the species is tolerant of early seral conditions provided there is some canopy cover, while individual plants seem to suffer from total canopy removal (Penny 1996). The species' documented ability to survive low-intensity fires but vulnerability to stand-replacing fire (Williams 1990) indicates that a stand-replacing wildfire in suitable habitat for this species could destroy entire occurrences. It would be impossible to predict that such a fire would actually occur; however, due to the high level of untreated fuels under this alternative, a future wildfire in suitable beetle-affected habitat for groundpine would be of a higher intensity.

Other moist forest and wet forest guild species occur in mid- and late successional habitats, and appear to prefer more closed canopy conditions. Those sensitive plant species likely to occur in beetle-affected areas that do not tolerate canopy openings include most sensitive **moonworts** (*Botrychium* species). Direct impacts could include loss of canopy cover over populations of these species. Indirect impacts to these species could include destruction of individual plants as beetle-killed trees fall over and disruption of soil mycorrhizae from loss of shade.

Two species of moonwort may occur in open meadow microsites (*Botrychium campestre* and *B. hesperium*) which have not been impacted by bark beetle activity. A stand-replacing wildfire resulting from heavy untreated fuels adjacent to habitats which support these species could impact habitat or individuals of these two species.

Peatland guild species occur in habitats that infrequently experienced fire. Peat coring in north Idaho peatlands (Rumely 1956 and Neihoff 1998) has revealed several charcoal layers in peat strata which accumulated since the last glacial period. It is not known whether peatland habitats which may occur in the Newport project area have ever dried sufficiently to support even a low-intensity wildfire. No direct or indirect impacts to peatland habitats would be expected from implementation of the No Action alternative.

A small amount of **cold forest** habitat (19 acres) has been affected by recent beetle activity. Direct and indirect impacts due to the resulting loss of canopy cover would be minimal, and would not lead to a loss of population or species viability or a trend to federal listing for any species in this habitat guild.

Possible impacts to **dry forest** guild sensitive plant species would be difficult to measure. With the exception of pine broomrape (delisted in May, 1999), habitat for dry forest sensitive species in the project area is generally restricted to specialized microsites of grassy meadows, rock cliffs or rock breaks. There have likely been no direct impacts to these species or their habitats from the recent bark beetle activity, and no harvest or project-related activities are proposed in dry forest microsites. Indirect impacts would probably be associated with stand-replacing wildfires resulting from heavy untreated fuel loads in adjacent moist or dry forest habitat.

Limited information for one dry forest (dry meadow microsite) species, **small-leaved pussytoes** (*Antennaria parviflora*) indicates that, while the species may colonize bare mineral soil, it is likely killed by most fires (Taylor 1969). One study of areas burned over 100 years ago reported its occurrence only in the oldest stands surveyed, indicating that the species' recovery from fire may be slow (Taylor 1969).

As a direct result of the recent beetle infestation, 2,256 acres of moist forest habitat have been or will likely be impacted; most of these impacts are attributable to loss of canopy cover and resulting reduction in soil moisture (and, in some cases, promotion of early seral vegetation which could outcompete some moist forest sensitive plant species). Approximately 2,860 acres of dry forest habitat have been impacted, while some level of impacts to wet forest habitat (also related to canopy cover, soil moisture and early seral vegetation) are predicted on 54 acres.

<u>Cumulative effects</u>

Cumulative impacts to wet forest habitat would be predicted to be low overall, given the small amount of such habitat that has been affected by recent bark beetle activity.

Cumulative impacts to highly suitable moist forest habitat related to loss of canopy cover would be predicted to be moderate where stands have been sufficiently opened to promote establishment of early seral understory vegetation. The likeliest cumulative impacts would be to those species with a broader habitat range (**moonworts** and **groundpine**) which seem to require dense shade and/or soil mycorrhizae and which may not compete successfully with early seral forbs. Cumulative impacts in stands where recent beetle activity has not reduced canopy cover below about 75 percent would be low. Cumulative impacts to moist or dry meadow microsites which could support some sensitive moonworts would be low.

Cumulative impacts to **dry forest** and **cold forest** habitat and sensitive species would be predicted to be low.

Cumulative impacts to peatland habitats are also related to catastrophic wildfires from heavy fuel loads. Such a fire, should it occur upslope from peatland habitats, could introduce elevated nutrient and sediment levels to these ecosystems. Peatland hydrology could also be altered. Such changes in peatland habitats could lead to a change in plant species composition and the extirpation of some sensitive plant species (Bursik and Moseley 1995). The risk of a future stand-replacing wildfire that could impact peatland habitats would be difficult to quantify. Cumulative impacts would be predicted to be low to moderate, depending on the occurrence and proximity to peatland habitat of a stand-replacing wildfire.

While the recent beetle activity has impacted habitats of **wet, moist** and **dry** and **cold** forest guilds, impacts would not lead to a loss of population or species viability or a trend to federal listing for any sensitive species of these guilds.

Effects Common To Alternatives B, C and E

<u>Direct and Indirect Effects</u>

The table below displays the amount of suitable habitat proposed for high risk activities (see Table III-246 above). Query tables used to calculate the acres/miles are located in the project file.

Table III-243. Suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternatives B, C and E.

Activity Type	Wet Forest	Moist Forest	Dry Forest	Cold Forest
Regeneration harvest tractor yarding (acres)	0	2	27	0
Selective harvest, tractor yarding (acres)	8	450	329	0
Grapple piling (acres)	0	0	0	0
Underburning (acres)	12	317	567	0
Road obliteration (miles)	0.16	3.83	4.90	0

In addition to Effects Common to All Alternatives and Effects Common to All Action Alternatives above, the following impacts to sensitive plants and/or suitable habitat are predicted:

While there are no known **groundpine** occurrences in the project area, suitable moist forest habitat for this species could be impacted by selective harvest and underburning in moist or wet forest habitat where bark beetle activity has killed more than 50 percent of standing trees. Impacts of harvest would be largely attributed to ground disturbance and fuels treatment, since only incidental additional green tree removal (hazard trees) would occur.

Cold forest habitat, while present in the project area, is not proposed for any high-risk harvest or project-related activities under these alternatives. There would be a low risk of direct or indirect impact to sensitive plant species from harvest or project-related activities in habitats of this guild. While individuals or habitat may be impacted, such impacts would not lead to a loss of population or species viability or a trend to federal listing for any sensitive species of this guild.

Cumulative effects

Cumulative impacts from canopy removal in wet and moist forest habitat would remain low to moderate, since associated green tree removal would not result in substantial further reduction of canopy cover. Cumulative impacts in wet forest habitat associated with ground disturbance would also be low.

Given the requirements for surveys and provision for protection of sensitive plant populations, cumulative impacts to **groundpine** from ground-based harvest activities would be considered to be low. A substantial reduction in the fuel loads in treated areas (see Fire/Fuels, Chapter III) also reduces the predicted cumulative impacts.

Alternative D

Direct and Indirect Effects

The table below displays the amount of suitable habitat proposed for high risk activities under Alternative D. Query tables used to calculate the acres/miles are located in the project file.

Table III-244. Suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative D.

Activity Type	Wet Forest	Moist Forest	Dry Forest	Cold Forest
Regeneration harvest tractor yarding (acres)	0	7	75	0
Selective harvest, tractor yarding (acres)	33	1,470	1,680	5
Grapple piling (acres)	0	0	0	0
Underburning (acres)	29	1,295	1,937	5
Road obliteration (miles)	0.53	6.72	6.65	0

In addition to Effects Common to All Alternatives and Effects Common to All Action Alternatives above, direct and indirect impacts from ground-based harvest activities under this alternative would be similar to those under Alternative B, with the exception that additional acres would be harvested if predictions of further Douglas-fir mortality from beetle activity are realized.

A small amount of **cold forest** habitat (5 acres) is proposed for high-risk harvest activities under this alternative. There would be minimal direct or indirect impacts from harvest activities; such impacts would not lead to a loss of population or species viability or a trend to federal listing for any species of this guild.

Surveys of highly suitable habitat and appropriate protection measures to protect sensitive plant populations are required prior to project implementation (see Chapter II). See the discussion of sensitive plant surveys later in this chapter.

<u>Cumulative effects</u>

Cumulative impacts related to loss of canopy cover from implementation of this alternative would be similar to those under Alternative B. Cumulative impacts related to soil disturbance from ground-based timber harvest, fuels treatments and underburning would remain low with requirements for survey and protection of sensitive plant populations.

Alternative F

<u>Direct and Indirect Effects</u>

The table below displays the amount of suitable habitat proposed for high risk activities under Alternative F. Query tables used to calculate the acres/miles are located in the project file.

Table III-245. Suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative F.

Activity Type	Wet Forest	Moist Forest	Dry Forest	Cold Forest
Regeneration harvest tractor yarding (acres)	0	5	48	0
Selective harvest, tractor yarding (acres)	12	944	1,250	0.17
Grapple piling (acres)	0	0	0	0
Underburning (acres)	22	888	1,483	0.17
Road obliteration (miles)	0.53	4.86	3.40	0

In addition to Effects Common to All Alternatives and Effects Common to All Action Alternatives above, direct and indirect impacts from ground-based harvest activities under this alternative would be similar to those under Alternatives B, C and E with the exception that harvest activity would focus on those areas adjacent to private lands.

A small amount of **cold forest** habitat (less than 1 acre) is proposed for high-risk harvest activities under this alternative. There would be minimal direct or indirect impacts from harvest activities; such impacts would not lead to a loss of population or species viability or a trend to federal listing for any species of this guild.

<u>**Cumulative Effects**</u>

Cumulative impacts related to loss of canopy cover from implementation of this alternative would be similar to those under Alternative B. Cumulative impacts related to soil disturbance from ground-based timber harvest, fuels treatments and underburning would remain low with requirements for survey and protection of sensitive plant populations.

Alternative G

<u>**Direct and Indirect Effects**</u>

The table below displays the amount of suitable habitat proposed for high risk activities under Alternative G. Query tables used to calculate the acres/miles are located in the project file.

Table III-246. Suitable habitat, by habitat guild, affected by activities considered to have a high risk to sensitive plants or suitable habitat, Alternative G.

Activity Type	Wet Forest	Moist Forest	Dry Forest	Cold Forest
Regeneration harvest tractor yarding (acres)	0	0	0	0
Selective harvest, tractor yarding (acres)	0	0	0	0
Grapple piling (acres)	0	0	0	0
Underburning (acres)	19	1,050	1,667	0
Road obliteration (miles)	0.53	5.10	3.77	0

In addition to Effects Common to All Alternatives and Effects Common to All Action Alternatives above, direct and indirect impacts from underburning under this alternative would be less than those under Alternatives B-F, since only 2,736 acres of suitable habitat would be underburned, with no timber harvest,

Cold forest habitat, while present in the project area, is not proposed for harvest or project-related activities under this alternative. There would be a low risk of direct or indirect impact to any sensitive plant species from harvest or project-related activities in habitats of this guild. While individuals or habitat may be impacted, such impacts would not lead to a loss of population or species viability or a trend to federal listing for any sensitive species of this guild.

<u>**Cumulative Effects**</u>

Cumulative impacts related to loss of canopy cover from implementation of this alternative would be essentially the same as those under Alternative A. Cumulative impacts related to soil and vegetation disturbance from underburning would remain low with requirements for survey and protection of sensitive plant populations.

Effects of Opportunities

Watershed restoration projects generally help to stabilize stream channels, thus protecting streamside vegetation from chronic disturbance. Sensitive plant species of **wet forest** guild habitats could be impacted during placement of in-stream structures and culvert removal at stream crossings. Site-specific surveys would be conducted prior to implementation of any such projects. Sensitive plant populations would be protected. Isolated or undetected individuals of some species may be impacted. These projects, while they may impact individuals, usually result in long-term benefits to sensitive plants and suitable habitat.

Timber stand improvement projects would occur in stands with overall low potential to support TES plant species. Individual sensitive moonworts could be impacted, with a low level of cumulative impacts expected.

Determination of Effects

Based on the above analysis, and with the provisions for surveys and protection of sensitive plant populations (Features Common to All Action Alternatives, Chapter II), the following table represents the determination of effects to sensitive plants for each alternative. The Biological Evaluation from which the table was derived is in the project file. A description of habitat guilds and list of sensitive species is included in Appendix B.

Table III-247. Summary of determination of effects on sensitive plant species, by guild, for each alternative.

Species	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
1. Aquatic Species	NI	NI	NI	NI	NI	NI	NI
2. Deciduous Riparian Species	NI	NI	NI	NI	NI	NI	NI
3. Peatland Species	NI	NI	NI	NI	NI	NI	NI
4. Wet Forest Species	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH
5. Moist Forest Species	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH
6. Subalpine Species	NI	NI	NI	NI	NI	NI	NI
7. Cold Forest Species	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH
8. Dry Forest Species	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH	MIIH

NI = No Impact
MIIH = May Impact Individuals or Habitat with no trend to federal listing or loss of species or population viability
WIIH = Will Impact Individuals or Habitat with a likely trend to federal listing and/or loss of population or species viability
BI = Beneficial Impact

Sensitive Plant Surveys

The following measures are required to validate the Determination of Effects in this EIS:

As described in Chapter II, all previously unsurveyed areas identified as highly suitable habitat that, as a result of the proposed activity, would have a high risk of adverse effects to sensitive plants or habitat and a likely reduction in population viability, must be surveyed prior to project implementation. Some areas previously surveyed may be resurveyed, based on the date and intensity of the most recent sensitive plant survey and the risk to sensitive habitat from proposed activities.

The table below displays the number of acres within and/or adjacent to proposed harvest units which must be surveyed prior to project implementation. Survey acres were based on coarse habitat query results (copies of which are in the project file), aerial photograph and topographical map interpretation, previous sensitive plant surveys, risk of adverse impacts to sensitive plants and suitable habitat from the proposed activity, and professional judgement. Specific units which must be surveyed are identified in Appendix D. It should be

noted that potential habitat occurs only in portions of many units, and in some cases the entire unit would not be surveyed.

Table III-248. Suitable habitat to be surveyed, Newport project area.

Alternative	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Wet Forest Guild	15 acres 0.16 miles	15 acres 0.16 miles	39 acres 0.53 miles	15 acres 0.16 miles	17 acres 0.53 miles	13 acres 0.53 miles
Moist Forest Guild	560 acres 3.83 miles	560 acres 3.83 miles	1,531 acres 6.72 miles	560 acres 3.83 miles	951 acres 4.86 miles	650 acres 5.10 miles
Dry Forest Guild	611 acres 4.90 miles	611 acres 4.90 miles	1,953 acres 6.65 miles	611 acres 4.90 miles	1,437 acres 3.40 miles	1,089 acres 3.77 miles
Cold Forest Guild	0 acres 0 miles	0 acres 0 miles	5 acres 0 miles	0 acres 0 miles	< 1 acre 0 miles	0 acres 0 miles
Total	1,186 acres 8.89 miles	1,186 acres 8.89 miles	3,528 acres 13.9 miles	1,186 acres 8.89 miles	2,406 acres 8.79 miles	1,752 acres 9.40 miles

In addition, surveys for project-related opportunities which may have an adverse impact on sensitive plants or highly suitable habitat would be conducted prior to implementation of those activities. As detailed in Chapter II, specific protection measures would be implemented to protect any newly documented population and its habitat.

Consistency With the Forest Plan and Other Applicable Regulatory Direction

Forest Plan Consistency

One Forest Plan goal is to "provide and manage habitat of threatened, endangered and sensitive species in an aggressive manner which contributes to the eventual removal of the species from...threatened, endangered or sensitive status" (Land and Resource Management Plan p. 4-2). Standards and guidelines for management of TES plant species include the following (Land and Resource Management Plan p. 4-42):

1) "Maintain and update lists of sensitive plants...periodically as new information is collected. Sensitive species lists for the Forest will be maintained and kept current with State and Forest Service Regional lists."

2) "No actions that are likely to jeopardize the continued existence of any plant...species or cause the need for listing any species [as] threatened or endangered, will be authorized, funded or carried out by the Colville National Forest."

3) "... ensure that no activity permitted, funded or carried out by the Forest Service jeopardizes the continued existence of a threatened or endangered species or adversely modifies the essential habitat of such species."

All alternatives proposing harvest activities within the CNF, with the requirements for surveys and implementation of protection measures as needed, would meet the intent of the Land and Resource Management Plan. The No Action alternative would also meet the intent of the Plan.

Forest Service Manual (FSM) Direction

The requirement for conducting sensitive plant field surveys was clarified in a letter from the Washington Office (Leonard 1992). The letter states that, according to FSM 2673.43 - Procedure for Conducting Biological Evaluations, "the intensity of the biological evaluation should be commensurate with the risk associated with the project and the susceptibility of the species involved. The need for and extent of field reconnaissance should be commensurate with the risk associated with the project and species involved, and the level of knowledge already at hand."

This analysis has addressed documented sensitive plant occurrences, the extent of suitable habitat and the effects of proposed activities on those species and habitats. Features designed to protect populations are incorporated into all action alternatives. Provisions for protection of populations identified prior to project implementation have resulted in a determination of No Impact for some species and habitats and May Impact Individuals but not likely to lead to a trend to federal listing or loss of species or population viability for others. All alternatives meet the direction provided in the letter and the intent of FSM 2673.43.

NOXIOUS WEEDS

CHANGES BETWEEN THE DRAFT AND FINAL EIS

Very few changes occurred between the draft and final EIS. The table of known weed infestations now reflects those that are found on the Newport Ranger District and within the project area, and those found within Pend Oreille county which may invade the district and the project area. The table of cover type distribution now reflects those cover types predicted from implementation of each alternative.

REGULATORY FRAMEWORK

The Federal Noxious Weed Act of 1974 defines a noxious weed as "a plant which is of foreign origin, is new to, or is not widely prevalent in the United States, and can directly or indirectly injure crops or other useful plants, livestock or the fish and wildlife resources of the United States, or the public health" (P.L. 93-629). The Act directs Federal land management agencies to establish an integrated management system to control or contain undesirable plants. The state of Washington has State, Regional and County Weed Boards which develop noxious weed lists for various parts of the state (RCW 17.10).

Federal legislation, regulations, policy and direction that require development and coordination of programs for the control of noxious weeds, and evaluation of noxious weeds in the planning process include: The National Forest Management Act (1976); the National Environmental Policy Act (1969); Forest Service Manual (Chapter 2080, as amended, 1995); Executive Order #13112 (February 1999); Colville National Forest Land and Resource Management Plan (Forest Plan); the Environmental Assessment for Integrated Noxious Weed Treatment, Colville National Forest (USDA 1998f); and the Region 6 Final EIS for Managing Competing and Unwanted Vegetation (USDA 1988b) as amended by the Mediated Agreement (Northwest Coalition for Alternatives to Pesticides, et al. v. Clayton Yeutter 1989).

The Forest Service Handbook FSH 3409, on Forest Pest Management defines a strategy for managing pests, including noxious weeds, as "A decisionmaking and action process incorporating biological, economic, and environmental evaluation of pest-host systems to manage pest populations" (FSH 3409.11). This strategy is termed Integrated Pest Management (IPM).

AFFECTED ENVIRONMENT

The recent scientific assessment of the Interior Columbia Basin found that herbaceous and shrub wetland vegetation types in the Upper Columbia River Basin (including riparian habitats) have declined in area from historical conditions, in part due to invasion by certain noxious weed species (Quigley and Arbelbide 1997). Wetland habitat in the project area is thus vulnerable to decline from encroaching weeds. Rangelands and dry forest types within the project area and surrounding region were described in the above assessment as having low ecological integrity, again in part due to noxious weed invasions (Quigley, Haynes et al. 1996).

The spread of noxious weeds can primarily be attributed to human-caused dispersal such as vehicles and roads (Roche and Roche 1991), contaminated livestock feed, contaminated seed, and ineffective revegetation practices on disturbed lands (Callihan et al. 1991). Vallentine (1988) explains that some of the worst noxious plant problems are caused by weed species such as leafy spurge, Canada thistle, the knapweeds, and Dalmatian toadflax. The introduction of some of these and other noxious weeds has occurred throughout the Newport project area, especially along major highways and travel routes, and areas within the forest that have experienced disturbance from intense recreation, road construction, and timber harvest activities. Non-native species can impact the native flora and reduce native biodiversity, especially in diverse habitats like

riparian zones, sensitive wetland communities or inherently rare plant communities in peatland fens and seeps.

Information on existing weed infestations was derived from previous noxious weed surveys within the project area. Most infestations are concentrated along road corridors, with occurrences of some weed species in the general forest. Infestation levels in the project areas vary from scattered isolated occurrences to large contiguous populations of one or more species.

Noxious weeds are those plant species that have been officially designated as such by Federal, State or County officials. The state of Washington categorizes weed species as follows: those which pose a serious threat to the state are listed as Class A; those which pose a serious threat to a region of the state are listed as Class B. Class B 'designate' species are those Class B weeds for which all seed production can be prevented within one year. Any other noxious weeds are listed as Class C.

Table III-249. Noxious weeds in or near the Newport project area.

Common Name	Latin Name	Class
bull thistle	*Cirsium vulgare*	C
Canada thistle	***Cirsium arvense***	**C**
common mullein	*Verbascum thapsus*	C
common tansy	***Tanacetum vulgare***	**C**
Dalmatian toadflax	***Linaria genistifolia ssp. dalmatica***	**B**
goatweed	***Hypericum perforatum***	**C**
houndstongue	*Cynoglossum officinale*	C
orange hawkweed	*Hieraceum aurantiacum*	B designate
oxeye daisy	*Chrysanthemum leucanthemum*	B[1]
plumeless thistle	*Carduus acanthoides*	B designate
reed canarygrass	*Phalaris arundinacea*	C
Scotch broom	*Cytisus scoparius*	B designate
spotted knapweed	***Centaurea biebersteinii***	**B**
yellow hawkweed	***Hieraceum caespitosum***	**B[2]**
yellow toadflax	*Linaria vulgaris*	C
Weeds found in Pend Oreille County - potential invaders onto NF lands.		
garden loosestrife	*Lysimachia vulgaris*	C
leafy spurge	*Euphorbia esula*	C
meadow hawkweed	*Hieraceum pratense*	C
meadow knapweed	*Centaurea jacea x nigra*	C
musk thistle	*Carduus nutans*	C
purple loosestrife	*Lythrum salicaria*	C
sulphur cinquefoil	*Potentilla recta*	B
tansy ragwort	*Senecio jacobaea*	C
yellow starthistle	*Centaurea solstitialis*	[3]

[1]*Oxeye daisy is not listed as a noxious weed for Pend Oreille County, but is listed as a class B in other parts of the State. It occurs in Pend Oreille County and is a weed of concern by the Forest Service.*
[2]*Class B weed south of Township 32N.*
[3]*Starthistle is not known to occur in Pend Oreille County, but is known in nearby counties.*

Documented weed infestations within the project area are addressed in the Colville National Forest Environmental Assessment for Integrated Noxious Weed Management (USDA 1998f). Approximately 700 acres of infestation are known in the project area. Weed species known to occur in the project area include Canada thistle, Dalmatian toadflax, spotted knapweed, yellow hawkweed, goatweed and common tansy.

Vegetation communities within the Newport District vary from dry and semi-dry to moist forest habitats and wetlands. A description of these communities can be found in Appendix C. Dry community types are inherently vulnerable to invasion by spotted knapweed, goatweed and common tansy (Lacey et al. 1995, Whitson et al. 1992). Certain habitat types within these communities are susceptible to invasion by yellow starthistle, rush skeletonweed, orange and meadow hawkweed and tansy ragwort following soil disturbance and reduction of normal canopy cover (Rice and Toney 1997).

Table C-1 in Appendix C, adapted from the recent scientific assessment of the Interior Columbia Basin, displays susceptibility of the project area's major vegetative community types to invasion by several weed species of concern. Susceptibility to invasion depends upon the weed's aggressiveness and the suitability of the community type as habitat for that weed. Of the prevalent cover types within the project area, grasslands (including fescue-bunchgrass, herbaceous wetlands and wheatgrass bunchgrass types) and drier, open-canopied forests (such as interior Douglas-fir and ponderosa pine habitats) are the most susceptible native habitats to weed invasion. Moist and shady forested types (such as those in western redcedar and western hemlock habitats) and higher elevation types are less susceptible to weed invasion.

Coarse habitat queries of beetle-affected areas were conducted for analysis of predicted cover types under each alternative, based on current information regarding susceptibility of different cover types to fifteen noxious weed species (see Table C-1). Site-specific information from recent field visits and personal knowledge and professional judgement of the Newport Ranger District Ecologist were also considered in the identification of areas susceptible to weed invasion. Habitat and cover type query results are located in the project file and are summarized in the table below. Acres under Alternative A are the cover types resulting from beetle activity. Acres under the action alternatives are those cover types predicted from proposed treatments.

Table III-250. Acres of susceptible vegetative cover types in areas potentially affected by harvest activities (including fuels treatments), by alternative.

Forest Cover Type	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Western Redcedar	361	193	193	164	193	0	0
Grand fir/western hemlock	583	0	0	257	0	120	25
Interior Douglas-fir	3,729	1,297	1,297	3,870	1,166	2,826	2,299
Interior Ponderosa pine	0	0	0	133	0	133	80
Western larch	29	29	29	29	29	0	29
Spruce/subalpine fir	0	0	0	0	0	0	0
Lodgepole pine	488	0	0	303	185	303	303
Total	**5,190**	**1,519**	**1,519**	**4,756**	**1,573**	**3,382**	**2,656**

ENVIRONMENTAL CONSEQUENCES

Methodology

Analysis was conducted using results of past noxious weed surveys, current distribution of weed species in habitats similar to those found in the proposed treatment sites, types of proposed treatments and the risk of weed spread and introduction of new weed invaders from the proposed activity, based on current knowledge and professional judgement.

Indicators used to measure impacts on weed spread and introduction include the number of acres proposed for ground-based timber harvest and/or fuels treatment, the number of miles of proposed new road construction and reconstruction, and the proximity of proposed treatment areas to known weed infestations.

As shown in Table C-1 in Appendix C, certain cover types have a high degree of vulnerability to invasion by several weed species. A "high" risk rating indicates that a particular weed can successfully establish and become dominant in a cover type in the absence of intense or frequent disturbance. Weed species considered invaders in the beetle-affected Douglas-fir forest cover type include spotted knapweed, diffuse knapweed, musk thistle, bull thistle, Canada thistle and sulfur cinquefoil.

Other weed species are considered colonizers, able to invade and establish in certain cover types after soil disturbance or canopy removal. Beetle-affected stands within the Newport project area fall into this "moderate susceptibility" category for many weed species of concern, including oxeye daisy, Dalmatian toadflax, orange and meadow hawkweeds, leafy spurge and yellow starthistle.

Direct, Indirect and Cumulative Effects

Effects Common to All Alternatives

Direct and Indirect Effects: Many weed species generally invade areas of soil, understory vegetation and canopy disturbance. However, even in the absence of soil or vegetation disturbance, some weeds will invade if tree canopy cover is significantly reduced. As beetle-killed trees lose their needles, areas with significant canopy reduction either from beetle kill alone or beetle kill plus timber harvest would be susceptible to invasion by oxeye daisy and common tansy in particular. Thus, canopy reduction resulting from beetle kill only or beetle kill plus timber harvest would have similar impacts on weed spread. Even in areas proposed for regeneration harvest under the action alternatives, additional canopy reduction from harvest of associated green trees would be negligible with regard to the risk of weed spread.

A few weed species will invade undisturbed habitats. Any suitable forest cover types (interior Douglas-fir, ponderosa pine, mixed conifer woodlands and shrub wetlands) adjacent to existing infestations of spotted knapweed, Canada thistle, bull thistle and sulfur cinquefoil are susceptible to invasion by these species under any alternative.

Cumulative Effects: For the above weed species the *long-term* difference between alternatives would be insignificant. Overall, for all alternatives, cumulative effects on oxeye daisy, common tansy, spotted knapweed, Canada thistle, bull thistle and sulfur cinquefoil would be predicted to be moderate in habitats susceptible to invasion by these weeds.

Effects Common to All Action Alternatives

Direct and Indirect Effects: There would be a slight increased risk of weed spread during and for a short time following project implementation in those areas proposed for selective harvest under all action alternatives. Where harvest would be ground-based, the risk of weed spread would be higher than where helicopter logging would occur. The highest risk of weed spread would occur in stands which have lost or are predicted to lose more than 50% of the overstory canopy to beetle mortality.

The risk of weed spread in susceptible habitat proposed for underburning would vary for different plant communities. Those areas where shrub species are predicted to dominate would be at lower risk, while grass and forb-dominated communities would be at higher risk for weed invasion. Drier sites in the project area are particularly vulnerable to expansion of existing populations of goatweed following timber harvest and underburning. There would be an increase in the risk of spread of yellow hawkweed from existing infestations. At the same time, treatment of fuels under the action alternatives would reduce the intensity of future wildfires. This would lower the long-term risk of weed spread into severely burned stands.

No mechanical fuels treatment is proposed under any action alternative. Fuels treatment by lop and scatter or yarding of tops minimizes soil disturbance and the risk of weed spread into treated areas.

There would be an increased risk of weed spread following road reconstruction. The difference in the amount of reconstruction between the action alternatives is insignificant with regard to the risk of weed spread. Vehicles using the roads could import new species into proposed treatment areas and expand existing populations. Seeding disturbed cut and fill banks with a temporary seed mix during project implementation would minimize this risk. Closure of all reconstructed roads followed by seeding with a permanent seed mix after completion of harvest and project-related activities would reduce the risk of weed spread over time to current levels.

Cumulative Effects: Given the species' pervasiveness, cumulative effects for goatweed and its potential for spread into treated areas would be moderate under all action alternatives. Infestations of yellow hawkweed in the project area are smaller and more scattered. Thus, with implementation of proposed prevention practices cumulative effects on the spread of this species would be predicted to be low. Cumulative effects related to invasion of new weed species would also be low.

Alternative A

Direct and Indirect Effects: Apart from Effects Common to All Alternatives above, there would be no direct impact to noxious weed infestations or risk of spread, since management activities would not change from current levels. Loss of canopy cover from Douglas-fir beetle mortality would increase the risk of weed invasion and spread in beetle-affected areas.

Cumulative Effects: Under this alternative, future wildfires in beetle-affected areas would be of higher intensity due to the resulting high level of untreated fuels; the risk of weed spread following such an event, were it to occur, would be extremely high. It would be difficult at best to predict where and when such an event would occur. Cumulative effects related to weed spread from a future stand-replacing wildfire would be low to moderate, depending on the occurrence in susceptible habitat and proximity of such a fire to existing weed infestations.

Based on the best available information, in the absence of wildfire cumulative effects on the spread of existing scattered populations of yellow hawkweed would be predicted to be low, while cumulative effects on the spread of the pervasive goatweed would be moderate under this alternative.

Effects Common to Alternatives B, C and E

Direct and Indirect Effects: Under these three alternatives, timber harvest and fuels treatment types would not vary significantly in their direct and indirect impacts on existing weed infestations as described above in Effects Common to All Action Alternatives. There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on 29 acres (some beetle-affected stands experienced sufficient Douglas-fir mortality that removal of dead and dying trees only would result in regeneration harvest). There would be a slight increase in the risk of weed spread from ground-based selective harvest on 788 acres. A substantial risk of the spread of goatweed from underburning on 896 acres would result. No mechanical fuels treatment is proposed under these alternatives. Weed prevention practices as proposed in Chapter II would reduce, but not eliminate, the risk of weed spread from harvest activities.

Cumulative Effects: There would be no cumulative effects beyond those described as common to all action alternatives above.

Alternative D

Direct and Indirect Effects: There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on 82 acres. There would be a slight increase in the risk of weed spread from ground-based selective harvest on 3,188 acres. A substantial risk of the spread of goatweed from underburning on 3,265 acres would result, while no mechanical fuel treatments are proposed. Weed prevention practices as proposed in Chapter II would reduce, but not eliminate, this risk.

Cumulative Effects: There would be no cumulative effects beyond those described as common to all action alternatives above.

Alternative F

Direct and Indirect Effects: There would be an increased risk of weed spread into skyline corridors and skid trails during ground-based regeneration harvest on 52 acres. There would be a slight increase in the risk of weed spread from ground-based selective harvest on 2,206 acres. A substantial risk of the spread of goatweed from underburning on 2,393 acres would result, while no mechanical fuel treatments are proposed. Weed prevention practices as proposed in Chapter II would reduce, but not eliminate, this risk.

Cumulative Effects" There would be no cumulative effects beyond those described as common to all action alternatives above.

Alternative G

Direct and Indirect Effects: Direct and indirect effects on weed spread in untreated areas would be the same as those under Alternative A. A substantial risk of the spread of goatweed from underburning on 2,736 acres would result, while no mechanical fuel treatments are proposed. Weed prevention practices as proposed in Chapter II would reduce, but not eliminate, the risk of weed spread from underburning.

Cumulative Effects: There would be no cumulative effects beyond those described as common to all action alternatives above on treated acres. Cumulative effects of areas not treated would be the same as those under Alternative A.

Effects of Opportunities

Watershed restoration projects such as road obliteration, **removal or improvement of stream crossings** and **placement of instream** structures to benefit fish habitat could increase the risk of weed spread and of new invasions through moderate, but localized, levels of soil and vegetation disturbance. Weed prevention practices such as seeding disturbed areas, would reduce this risk. Removal of unneeded roads and road segments also reduces the availability of travel corridors which hasten the spread of weeds from vehicle traffic.

Timber stand improvement projects would have no appreciable effect on the spread of weeds.

Consistency With the Forest Plan and Other Applicable Regulatory Direction

Forest Plan Consistency

The Colville National Forest Land and Resource Management Plan (Forest Plan) (1988, pp. 4-60) identified the following standards and guidelines relating to noxious weed management:

1) *"Integrated pest management strategies will be utilized to manage pests within the constraints of laws and regulations to meet Forest management objectives."*

2) *"Emphasis will be given to the control and reduction of noxious weed infestations."*

All action alternatives in the Newport project area, with the provisions for minimizing weed spread and the noxious weed prevention strategy outlined in Appendix C, would meet the intent of the Forest Plan. The No Action Alternative would also meet the intent of the Plan.

Mediated Agreement

A noxious weed prevention strategy for the Newport portion of the analysis is included in Appendix C and is incorporated in the alternatives. The role and nature of associated vegetation is discussed, the presence of unwanted vegetation is discussed, conditions that favor the presence of unwanted vegetation were considered, natural controls were considered and a management strategy was developed. This management strategy helps avoid conditions that favor the presence of unwanted vegetation. All action alternatives in the Newport project area meet the requirements as set forth in the Mediated Agreement.

WATERSHED

CHANGES BETWEEN THE DRAFT AND FINAL EIS

The watershed section was revised extensively to improve readability and understanding. Five key indicators were dropped because they were found to be insensitive to the proposed activities. These five key indicators are the number of road crossings per mile of stream (crossing frequency); the percent of hydrologic openings in a watershed; the percent of stream miles modified by encroaching road (GIS roads within a 50 foot buffer of the GIS stream layer); the miles of those modified reaches that have reduced the potential for direct shade to the stream reach (direct shade reduction); and road density. Some analysis areas were truncated so that differences in effects, as modeled, would be more apparent.

REGULATORY FRAMEWORK

The Forest Plan for the Colville National Forest provides direction regarding the management of land to enhance and protect aquatic resources. In addition to direction established by the Forest Plan, all activities will comply with rules and regulations governing the state in which the proposed activity will occur. Activities are proposed in the State of Washington.

Beneficial uses are protected by Best Management Practices (BMPs) as identified in the Washington Forest Practices Rules and Regulations (Title 222 WAC). BMPs are the primary mechanism to enable the achievement of water quality standards. The U.S. Forest Service, Pacific Northwest Region (R6) has developed a set of general BMPs, described in General Water Quality Best Management Practices, November, 1988. This publication describes the legal background of BMPs, including the role of BMPs in meeting the Clean Water Act, and the Memorandum of Understanding between the Forest Service and Washington State Department Of Ecology regarding the use of BMPs on Federal Lands (1978). The full text of the regional, common forest-wide, and site specific BMPs are located in the analysis file.

The selection and design of BMPs are an integral part of the Colville Forest Plan (see the Forest Plan pages 4-50 through 4-54). In addition to BMPs, the Colville Forest Plan developed forest-wide standards and guidelines for the protection and management of water quality and aquatic habitats (see the Forest Plan pages 4-43 to 4-44, 4-50 to 4-54, and Forest Plan FEIS appendix G). The Inland Native Fish Strategy (1995) developed additional standards and guidelines.

AFFECTED ENVIRONMENT

The Pend Oreille River begins as the Clark Fork River near Butte, Montana, and flows into the Columbia River near Trail, British Columbia. The basin area of the Pend Oreille River upstream of Newport is approximately 16,128,000 acres (WSDOE 1995). There are several dams on the Pend Oreille-Clark Fork river system in Idaho, Montana, and Canada. All water in the planning area is tributary to Box Canyon Reservoir, the portion of the Pend Oreille River between Albeni Falls Dam and Box Canyon Dam. Beneficial water uses for the Pend Oreille River and it's tributaries in the Newport planning area include water supply for individual homes, farms and ranches that draw water for a variety of uses such as household, gardens, stock and irrigation; habitat for fish including native fish species, habitat for wildlife including riparian and other wetland habitats; water contact recreation, and power generation at Box Canyon dam.

The geology is an important feature to understand the landscape in this area. The underlying geology is dominated by metamorphic rocks of the great belt group. Most of these rocks are hard metasediments such as quartzite, sandstone, and argillite. Generally, the beds strike north-south and dip steeply both east and west. These hard rocks have created numerous short steep peaks such as Half Moon Hill, Kings Mountain,

Cooks Mountain, and Ojibway Knoll; and areas of shallow rocky soils especially on south aspects. A small area of granitic rock from the Kaniksu batholith occurs in the area near North Skookum Lake and Split Creek. This rock is generally softer, and forms the saddle between South Baldy and Ojibway Knoll.

The area is faulted -- generally the faults tend SE-NW and the cross-faults tend SW-NE. These faults are believed to be very old (Schroeder, 1952). All of the major streams in the analysis area follow fault features. Faults have also created 'gaps' such as the gap from Skookum Creek past Half-moon Lake to Browns Creek; and the gap between CCA Creek and Mill Creek (section 1 and 12, T. 34N., R. 44E). Most of the faults occur in a zone west of Cooks Mountain and Browns Lake -- breaking this portion of the landscape up into small steep hills and valleys.

On top of this complicated underlying geology, glacial, lacustrine and alluvial materials fill in the low lying areas. Numerous different terraces are evident, and the edges of the terraces are often steep. Some of the terraces extend far up the drainages, and they occur as high as 3,600 feet in elevation. These terraces may contain glacial outwash, glacial till, glacial lacustrine, and/or alluvial material. Outburst flood deposits (from the Missoula flood events) occur at the south end of the analysis area, forming terraces at high elevations (i.e. Mystic Lake). These terrace formations are responsible for the blind drainages in the analysis area.

Pre-Settlement Conditions

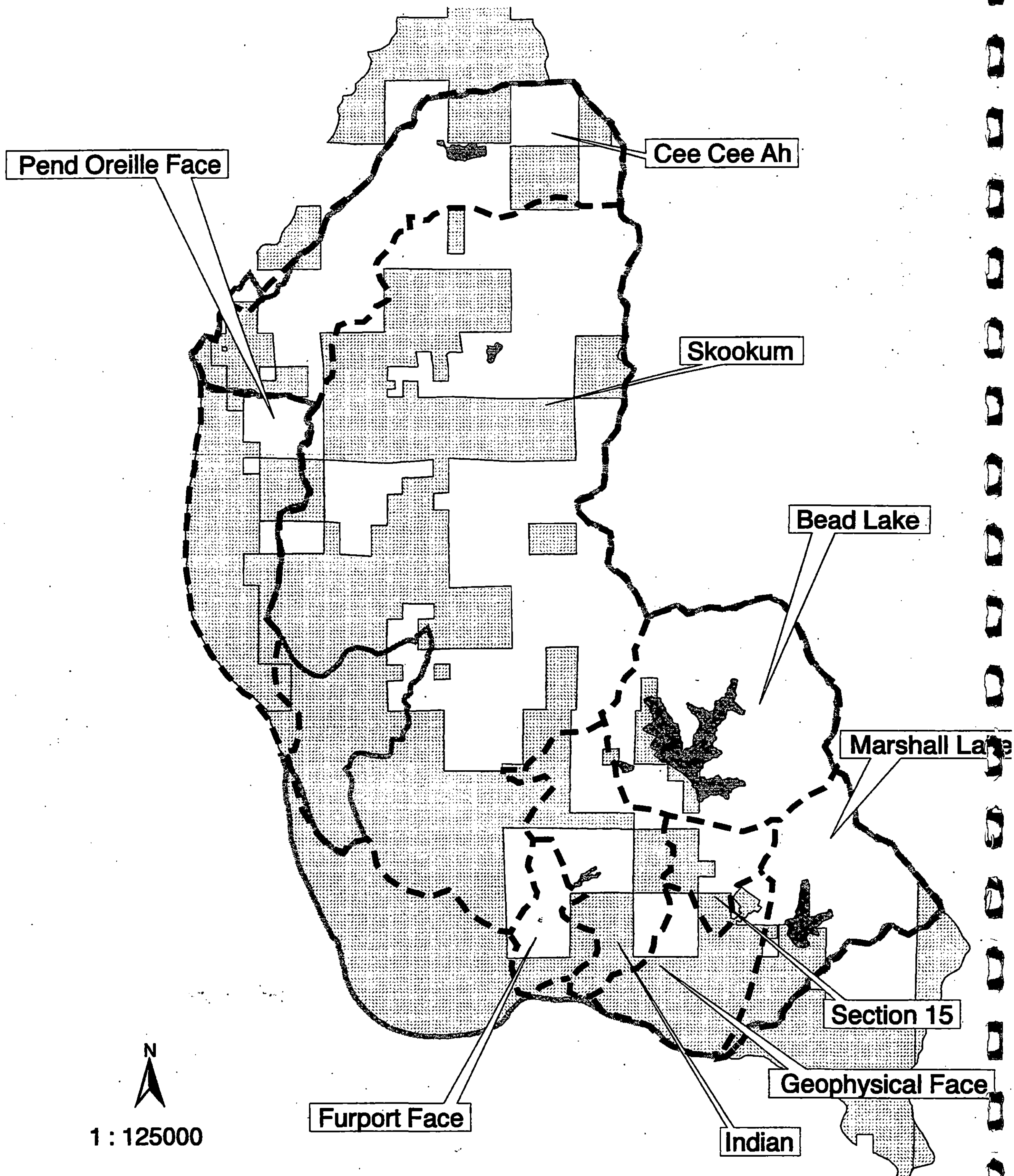
The landscape along the Pend Oreille River has changed since before Euro-American settlement. Under pre-settlement conditions, the watersheds had developed under the fire regimes described in the vegetation section. The primary erosional process was probably geologic creep occasionally augmented by pulses of sediment following infrequent stand replacement fires. Landslides were relatively rare. Stream channels were generally able to process sediment inputs before the next stand replacement fire. Changes in peak flows probably occurred in response to large stand replacement fires and weather conditions. Rain-on-snow and spring runoff events would have been the most common flooding events on tributary streams. Flooding along the Pend Oreille River generally occurred late in the spring or early summer (May or June) and was due to spring runoff elsewhere in the basin.

Riparian vegetation was often spared during most of the fires that occurred under pre-settlement conditions. Low severity and mixed severity fires would generally have not burned in riparian areas due to the higher moisture regimes. Stand replacement fires may have burned riparian areas depending of the fire conditions and behavior. Under pre-settlement conditions, the coniferous riparian vegetation would have been dominated by larger trees -- often large cedars. Other segments, probably the low gradient segments, would have been dominated by hardwoods and brush. Beaver would have colonized may of these low gradient segments of the streams, especially near the Pend Oreille River.

Post-Settlement Conditions

The effects of settlement on vegetation and fire regimes is discussed in previous sections. Early settlement in this area saw the development of a road system and the clearing of lands for agricultural purposes. Logging in the analysis area probably started about the turn of the century. Many of the road systems were built adjacent to streams. Riparian vegetation was often cleared, especially in the lands cleared for agricultural uses and grazing. Livestock grazing was introduced to the lower portions of the analysis area. National Forest System lands in this planning area were not subject to homesteading before acquisition by the Forest System.

Analysis Watersheds Versus Newport Project Area



Existing Conditions

An assessment of existing conditions is critical to environmental analysis because it both describes the current condition of the project area and provides a basis for comparing the effects of management alternatives. The watershed restoration emphasis for this project is streamside and hillslope roads, which are in many cases, sources of sediment to streams; which can affect beneficial uses of the water. This existing condition discussion was developed from many information sources including field surveys, aerial photographs, Geographic Information Systems (GIS), hydrologic response techniques and models such as WATSED, and other watershed and aquatic data derived by the forest service and its partners. The assessments used as a general model the principles and processes in *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis* version 2.2, August 1995.

The project area was first subdivided into manageable watershed units for analysis. Two types of units were identified: true watersheds and composite watersheds. True watersheds are areas of land in which all of the streams are interconnected and drain through a single point. True watersheds in the Newport planning area are Half Moon Creek, North Fork Skookum Creek, Indian Creek, Bead Lake and Marshall Lake. For purposes of analysis, some "composite watersheds" consisting of smaller, but independent watersheds have been grouped together. In some composite watersheds, streams are not directly interconnected, but are assumed to connect through sub-surface flows (e.g., Skookum Creek and Halfmoon Lake basin; South Fork Skookum Creek, Cooks Lake, and Mystic Lake basins). In some cases, small independent watersheds were put together to make an analysis area (e.g., Pend Oreille face drainages).

Watershed Processes and Analytic Criteria Used to Characterize the Existing Conditions of the Watersheds

Based on information developed in the Geographic Assessment of the Pend Oreille River Basin (draft as of May 1999), in the New Moon Ecosystem Analysis, and LeClerc Creek Watershed Assessment (done by Stimson Lumber Company under the direction of the Washington State Department of Natural Resources), the following watershed processes were identified. These processes tend to dominate the watershed and their associated stream networks.

INCREASED PEAK FLOWS THROUGH EXTENDED CHANNEL NETWORKS

Forested watersheds like those in the Newport planning area, typically transport runoff subsurface through the soil mantle until it reaches the proximity of a surface water conveyance (like swales and stream channels). As long as the water movement is subsurface, the rate of movement is relatively slow compared to channeled free water flow on the surface. A watershed has a network of channels that tend to expand in length (and width) as any substantial runoff event proceeds. As the network expands, such as during the spring snow melt, not only is more water being moved within that expanding area, but that water is being moved in the more rapid free water movement stage. That expanding area around and including stream channels is called the *contributing area* of the watershed. The larger the contributing area of the watershed is, the greater the flow rates will be to and through the main watershed streams.

Roads, landings and excavated skid trails, especially those on steeper landtypes, have often been excavated to a depth that intercepts the down slope moving subsurface water. That water can then be routed freely on the surface until it reaches an area where restricted soil permeability allows it to infiltrate again - or to a stream channel (or a stream's contributing area) where it will be rapidly be delivered through the system. Consequently, if a watershed has a high density of "extended channels" created by these road conditions, the overall system response may be dramatically amplified.

Many watersheds and subwatersheds of the Newport planning area have high road densities. Where the associated landtypes are susceptible to interception of subsurface slope water by those roads, there is a potential for substantial expansion of the channel network and contributing areas during runoff-producing

events. It is not likely that this process alone is the principle cause of the channel deterioration that is ongoing. However, this ongoing process of expanding contributing area by the extension of the channel networks with roads may be contributing to the continued lack of equilibrium and degrading trends that have developed.

The scope and extent of this impact can be estimated by determining the **channel network extension.** Roads approaches to streams tend to intercept ground water and quickly route it as surface runoff to the stream, often resulting in higher local storm discharges and additional sediment loading. This phenomenon is more pronounced where steep ditch lines are extensive or where roads are insloped with few cross drains. The characteristic is listed as the estimated **channel network extension** relative to (%) of the perennial stream length in the watershed from GIS analyses.

CHANGES IN WATER YIELD AS A RESULT OF VEGETATIVE CHANGES INCLUDING INCREASED PEAK FLOWS FROM RAIN-ON-SNOW CLIMATIC EVENTS

Water yield is a generic descriptor related to the changes in the rate, frequency, and timing of the runoff a watershed exhibits in response to hydro-climatic events (rainfall and snow melt). There is some suggestion that snow melt hydrographs have become more exaggerated and peaked, primarily due to extensive vegetative changes on the slopes. Essentially, it is thought that patterns of regeneration harvests, large stand-consuming fires, insects, and disease have altered snowmelt patterns to the extent where normally desynchronized runoff from the various aspects, elevations, and slope positions within typically third-order watersheds have in fact become synchronized runoff.

North Idaho and eastern Washington are under a strong maritime influence where warm moist weather fronts invade in the winter from the Pacific Coast. Although the intervening mountains in northern Washington substantially reduce the moisture that reaches this area, relatively warm and moisture-laden air masses occasionally inundate the area and have a profound effect on the hydrology of the Newport planning area. In this area, rain-on-snow events are relatively uncommon (the last one occurred in 1974), but when they do occur they represent the highest peak flows in this area.

In northern Idaho, the snowpack that is most often susceptible to rain on snow lies in the 3,000 to 4,500-foot elevation range. Below 3,000 feet, the snow pack is often transitional during the winter (it may accumulate and abate several times during the season) and may not be a substantial contributor to overall basin runoff. In many years the snow pack above about 4,500 feet is usually "cold" with a large thermal deficit in the midwinter months.

Rain-on-snow response can be affected by management or natural vegetative modifications that can minimize the boundary layer. Openings in timber stands permit a relatively smooth flow of air to blow over the snowpack and retard the formation of boundary layers. An effectively closed tree canopy reduces wind velocity, allowing a deep boundary layer to form. Trees in a more open stand that extend above the snow surface can create turbulence which increases the boundary layer. Brush is ineffective since it rarely extends the necessary height above the snow pack surface of this area. Snags may create some turbulence, but their sparse character and lack of limbs and foliage greatly reduces their effectiveness.

Rain on snow is a natural process under which the streams of the basin developed. However, within the Newport planning area, the dominant channel forming events are associated with spring runoff. The historic streams of the basin were very stable and resilient due to the variability of the climatic processes under which they developed and the nature of the dominant geology of the basin. Rain on snow probably did not cause the loss of main stream equilibrium. However, the exaggeration of the frequency and magnitude of rain on snow events by management may be perpetuating the streams loss of equilibrium.

The inherent sensitivity of each watershed to rain-on-snow events can be estimated by calculating the **sensitive snowpack.** This parameter does not change with activities, therefore it is not carried into the

environmental consequences section. It does, however, provide a basis and reference point for the watershed effects estimated in the consequences section, as well in the design and location considerations of each alternative. The portion of the watershed that supports this sensitive snowpack is a parameter that is partially representative of the overall sensitivity of the watershed itself. As a point of reference, watersheds with a small proportion of sensitive snowpack (<30%) do not appear to be very responsive to rain-on-snow events at the watershed scale. Watersheds with a large proportion (>70%) of sensitive snowpacks are often highly volatile and are further very sensitive to other disturbance regimes in terms of runoff from the stream system. Most of the watersheds in the Newport planning area have between 40 and 80% sensitive snowpack.

Estimated peak flow (Q_2) is the instantaneous discharge that is expected to occur on average about every two years over. This value is NOT based on vegetative condition, but rather reflects the physical attributes of the drainage. It is calculated in cubic feet per second per square mile of drainage area. Runoff modification and equivalent clearcut area reflect roads and vegetative management. The anticipated runoff modification, and equivalent clearcut area for each watershed were derived from methods documented in the R1/R4 Sediment Guides (Cline et al. 1981) and the WATBAL Technical User Guide (Patten 1989); and calibrated on the Idaho Panhandle National Forest. The **runoff modification** is shown as a percent of the "natural" peak month discharge and reflects watershed climate patterns and disturbance history. The **equivalent clearcut area** is used to express the percentage of hydrologic openings in a watershed and accounts for vegetative recovery since the initial disturbance.

DIRECT DELIVERY OF SEDIMENT AND BEDLOAD MATERIAL FROM HILLSLOPES TO STREAMS

Perhaps the most profound change in fluvial processes is the change from a landscape dominated by a pulse sediment regime, to a press sediment regime. Under a pulse regime, large amounts of sediment would enter the fluvial system periodically like after a stand-replacing wildfire. In the years following the event, sediment yield would quickly decline toward a base level. Generally, the channel could move the sediment through the system before another pulse occurred. Under a press sediment regime, sediment enters the fluvial system every year, generally during high flows. Most of the sediment in managed watersheds comes from roads and landings in close proximity to streams.

All national forest lands have been classified based on local geomorphology, hydrology, and soils characteristics into units known as *landtypes*. One of the characteristics of a watershed related to sediment delivery is the percentage of the watershed classified as sensitive. **Sensitive landtypes** include both lands with high sediment delivery potential and high mass failure (landslide) potential. As a point of reference, watersheds made up of more than about 30% sensitive landtypes are often very sensitive to cumulative disturbances. Like sensitive snowpack, sensitive landtypes are an indication of the inherent sensitivity of the watershed based on natural conditions under which it evolved. This parameter does not change with management.

The estimated long term **annual sediment loads** for a watershed or watershed area were derived from methods documented in the R1/R4 Sediment Guides (Cline et al. 1981) and the WATBAL Technical User Guide (Patten 1989); and calibrated on the Idaho Panhandle National Forest. The annual sediment load values are reported as tons per year per square mile of drainage area. The current anticipated **sediment load modification** is expressed as a percent of the "natural" sediment load and is based on the history of disturbances and climate patterns in the watershed.

Sensitive road density is a similar measure to road density, except that the road considered are only those on sensitive landtypes. This and other road stratifications appear to better explain watershed responses than road density alone.

Riparian road density is estimated from road segments within 300 feet of any perennial stream. The **number** and the **risk of failure** at inventoried stream crossings was inventoried and tracked. Risk of failure is a function of 1) the probability of failure of the crossing over an assumed design life (20 years); and 2) the cost

of the failure to watershed and aquatic resources. Certainly, most failures are event based and do not occur incrementally over time. But, in order to provide a basis for comparison, the risk was calculated and reported as tons of sediment that could be delivered per year over the design life of the crossing. **Stream crossing frequency** is the number of road crossings divided by the number of miles of stream in a watershed.

DIRECT RIPARIAN AND INSTREAM DISTURBANCES

Logging practices in riparian areas and stream bottoms have frequently resulted in extensive and long-term loss of large woody debris, channelization and changes of alignment, loss of structural components, extensive compaction of soils and other hydraulic modifications. Roads and other facilities in valley bottoms inevitably occupy areas that the stream channel and its floodplain and low terraces would normally occupy. This encroachment creates a constriction in the normal stream environment. Consequently, when large streamflows are forced through a smaller (constricted) channel and floodplain than it was "designed" for during thousands of years of floods, some adjustment has to be made. That adjustment is in the form of deeper water flows which lead to flooding and increased velocity of flows which creates erosive energies that can entrain more material. This in turn may result in accelerated bed scour and bank erosion, depending on the path of least resistance. That erosion is the source of tremendous magnitudes of sediment and can cause abnormal drastic and prolonged channel adjustments which may even trigger new adjustments downstream.

Miles of **encroaching road** within bankfull stage (normal flood stage) addresses the inability for affected reaches to adjust to upstream and climatic events. These were inventoried in the project area if they were within the geographical scope of the project.

OTHER CRITERIA USED TO DESCRIBE THE EXISTING CONDITIONS

Watershed Status Descriptors

Properly Functioning Condition (PFC) - These watersheds are functioning properly within their dynamic environments. The objective is to maintain and protect these systems. Watershed and aquatic objectives are usually the primary ecosystem objective. There is no priority for watershed system restoration because they are not damaged or at risk. However, local or site specific improvements may be effective to enhance water resource values.

Functioning at Risk (FAR) - Watershed systems functioning at risk are still properly functioning in their environment, but they either are exhibiting a downward trend, or have substantial disturbance elements that can reasonably be expected to compromise the PFC status. Theses systems are the highest priority for system restoration. These systems are intact and have the greatest potential for recovery. Some risks may be consistent to promote other ecosystem restoration, but watershed and aquatic objectives remain as primary.

Not Properly Functioning Condition (NPFC) - These watershed systems are essentially not functioning appropriately under their present environment. They are not intact as a system and they are not capable of reasonable rates of recovery without substantial external effort and resources. They do not usually exhibit dynamic equilibrium.

The common **watershed** name or area are listed with it's **Hydrologic Unit Code** (HUC) as determined by the U.S. Geologic Survey (1975).[1] The **drainage area** for the watershed or area is displayed in square miles. Watershed boundaries were determined by project hydrologists based on topographic maps. In some cases, drainage areas were truncated to avoid large areas of private land. In this area this truncation was done for 3 reasons -- first, the WATSED model used is primarily based on forest practices and is not calibrated to estimate effects from other land management practices; second, data on private lands that do not belong to forest products industry are limited; and third, the initial analysis showed that effects of the alternatives were very hard to discern in larger watersheds containing allot of private lands. Maps of the analysis

1 - The HUC is a hierarchal watershed classification based on the position of a watershed within its parent watershed. Each "code" in this system is two digits. The HUC for this portion of the Pend Oreille River basin is 17010216 (this is considered a 4th code HUC). Subdivisions into smaller areas, such as Skookum Creek, were done by the U.S. Forest Service.

areas are in the analysis files. The narrative part of the effects analysis addresses the entire watershed as well as the more intensely studied subwatersheds.

The apparent physical **status of the watershed** (or tributaries within it) has been estimated based on known conditions, the watershed sensitivity and resilience, and the disturbance history in the drainage. While this status description uses terminology similar to Process for Assessing Proper Functioning Condition (USDI, 1993), the process is not the same and the findings are not the same as would be found using the USDI process.

Section 303(d) of the Clean Water Act requires the States to list water bodies (stream segments and lakes) that do not support beneficial uses, even though BMPs are employed. If any part of a watershed contains one or more segments that are listed as **Water Quality Limited,** that is indicated in the table.
The presence of **fish migration barriers** was noted in fish-bearing streams.

Existing Conditions of the Newport Planning Area Watersheds

The Newport analysis area includes a series of 3rd, 4th and 5th order streams that flow into private land and ultimately into the Pend Oreille River. Private land is interspersed throughout the project area. Valley side slopes throughout the entire area vary from 20 to 40 percent and are vegetated predominately with conifers. Activities such as timber harvest and road building have occurred throughout the watersheds within the analysis area. As a result of this analysis, watersheds were categorized as one of the following: 1) properly functioning, 2) functioning but at risk, and 3) those that are in a non-functioning state. Within this analysis area, Half Moon Creek and Burnt Creek are identified as properly functioning watersheds. CCA Creek, Browns Creek, Upper Browns Creek, North Fork of Skookum Creek, Split Creek, tributaries to North Skookum Lake, Cooks Creek, South Fork of Skookum Creek and Lodge Creek are functioning at risk. Skookum Creek, Little Skookum Creek, Indian Creek and Sandwich Creek are not properly functioning watersheds.

The Newport planning area includes some watersheds addressed in the New Moon Ecosystem Analysis at the Watershed Scale. In this assessment area, there are several primary hydrologic processes that tend to dominate the watersheds and their associated stream networks behaviors, several of which are reflected to varying degrees in this project area.

Water Quality and Watershed Condition in the Newport Project Area

Approximately 490 miles of federal, state, county and private road and about 360 road channel crossings exist in the Newport watershed analysis area, with average road densities of 3.5 miles/square mile. The stream crossing frequency throughout the watershed ranges from 0.7 to 2.8 stream crossings/mile of stream. Within the Newport planning area, 8% of the land is on sensitive landtypes with high landslide and sediment delivery potential, with approximately 0.2 miles per square mile of road on sensitive land types that are susceptible to high landslide potential.

Table III-251. Watershed characteristics, condition indicators, and dominant watershed disturbances, Pend Oreille River Face Watersheds.

Characteristic or Indicator	Furport	Section 15	Geophysical
Physical Characteristics			
HUC	1701021600	1701021600	1701021600
Drainage area	2.0	1.3	0.9
Sensitive landtypes	6%	17%	6%
Sensitive snowpack	0%	62%	46%
Qualifications			
Listed as Water Quality Limited	No	No	No
Apparent watershed status	FAR	FAR	FAR
Subwatersheds used for analysis	n/a	n/a	n/a
Hydrologic Regime			
Estimated peak flow	23	28	30
Current runoff modification	.9%	10%	1%
Equivalent clearcut area	10%	17%	6%
Erosion and Sediment			
Estimated annual sediment	13.5	16.3	10.1
Current sediment load modification	133%	65%	24%
Road density	3.5	4.5	2.4
Sensitive road density	0.6	0.4	0.1
Channel Conflicts			
Road encroaching at bankfull stage	0	0	0
Riparian road density	9.8	2.7	2.3
Stream Crossings			
Number of inventoried crossings	3	2	0
Risk of failure for inventoried crossings	2.9	1.3	0
Stream crossing frequency	0.5	0.7	0

Pend Oreille River Face Watersheds

The Pend Oreille River Face Watershed refers to a series of areas and small drainages adjacent to the Pend Oreille River. The Pend Oreille Face is an analysis area composed of three analysis areas; Section 15, Geophysical, and Furport. Parts of two of the analysis areas (Geophysical and Furport) flow into the Pend Oreille River. Section 15 is a parcel of land between Bead Lake and Marshall Lake. Water from this area flows into the Geophysical area where it soaks into the ground – presumably flowing subsurface to the Pend Oreille.

The small tributaries feeding into the Pend Oreille River are located primarily on private lands with only a limited amount of National Forest lands. Most of the tributaries flow through agricultural lands prior to flowing into the Pend Oreille River. None of the streams in the Pend Oreille face watersheds are fish-bearing.

The Pend Oreille River in this section is listed as a Water Quality Limited stream by Washington State Department of Ecology. It fails to meet water quality standards for temperature, pH and exotic aquatic plants (Eurasian watermilfoil). None of the tributary streams on the face drainages are listed. It is difficult to assign a function condition to the Pend Oreille River/Box Canyon Reservoir. It is now a dammed system that is considerably different than in pre-settlement times.

CCA Creek Watersheds

CCA Creek includes two major tributaries, Browns Creek and Half Moon Creek. The mainstem of CCA Creek is outside the Newport planning area, but is included as part of the analysis area.

Browns Creek Watershed: Browns Creek can be divided into two segments. Upper Browns Creek flows into Browns Lake. The lower segment begins from springs below Browns Lake and flows into CCA creek. The two sections are not connected by surface streams. According to recent stream surveys, the Brown's Creek basin is considered to a hydrologic system that is "functioning at risk". Overall, Brown's Creek is fairly stable though the surveyors noted isolated areas of both aggradation and degradation. Sediment from Browns Creek Road (FR 1921) is the likely source for much of the fine sediment. The primary beneficial use is fish habitat. The basin includes a mix of private forest industry landowners, state and federally managed lands.

Half Moon Creek: This stream was surveyed in the fall of 1998 by two fish biologists. These surveyors reported that Half Moon Creek is a perennial stream though no fish were observed. According to the surveyors notes, Half Moon Creek has potential for spawning and rearing habitat, but is lacking in adequate fish habitat. The primary beneficial use is fish habitat.

CCA Creek Watershed: This watershed was partially surveyed in the late fall of 1998. Most of the watershed is outside the Newport planning area. The survey data leads to the conclusion that this stream basin is functioning at risk (FAR). According to the surveyors, about 70% of the headwaters of the CCA basin have been harvested. This extensive timber harvesting and road construction resulted in degraded streams that transported large volumes of sediment to the mainstem of CCA Creek. The mainstem of CCA Creek has a high level of cobble embeddedness. During high flow events, it appears that the stream is transporting pulses of sediment. As the stream flows recede, this sediment is deposited behind obstructions or in pools. Still, despite the historical land uses in the headwaters, the channel is functioning and becoming more stable. During the stream survey, it was noted that the extensive beaver dams in CCA Creek may be stabilizing the channel by limiting channel downcutting and lateral migration while storing large amounts of fine sediments. The primary beneficial use is fish habitat.

Table III-252. Watershed characteristics, condition indicators, and dominant watershed disturbances, CCA Creek subwatersheds.

Characteristic or Indicator	Browns Creek	Half Moon Creek
Physical Characteristics		
HUC	1701021617b	170102161700
Drainage area	8.4	1.6
Sensitive landtypes	12%	1%
Sensitive snowpack	66%	64%
Qualifications		
Listed as Water Quality Limited	No	No
Apparent watershed status	FAR	PF
Hydrologic Regime		
Estimated peak flow	29	29
Current runoff modification	8%	10
Equivalent clearcut area	7%	11
Erosion and Sediment		
Estimated annual sediment	17.6	20.1
Current sediment load modification	45%	32%
Road density	4.7	3.3
Sensitive road density	0.3	0
Channel Conflicts		
Road encroaching at bankfull stage	0	0
Riparian road density	5.9	3.9
Stream Crossings		
Number of inventoried crossings	4	0
Risk of failure for inventoried crossings	2.8	0
Stream crossing frequency	1.7	2.2
Number of fish migration barriers	0	0

Skookum Creek Watersheds

The Skookum Creek watershed is the largest in the Newport planning area, and the third largest tributary to the Pend Oreille River/Box Canyon Reservoir. The main forks of Skookum Creek are 1) the main stem, 2) North Fork Skookum Creek which includes Little Skookum Creek, and 3) South Fork Skookum Creek which includes Cooks Creek, the Cooks Lake basin, Mystic Lake, and Sandwich Creek. Skookum Creek flows off National Forest System lands and crosses a large amount of private lands before entering the Pend Oreille River. Much of this private land is used for grazing, agriculture, and homes. Beneficial uses off the National Forest include livestock, agriculture, and individual intakes for homes and gardens.

Main Stem Skookum Creek Watershed: For this analysis, the main stem of Skookum Creek is the segment upstream from it's confluence with the North Fork and includes Half Moon Lake basin. Half Moon Lake basin is a small blind basin terminating in Half Moon Lake. Water from the lake may flow underground into the main stem of Skookum Creek.

Table III-253. Watershed characteristics, condition indicators, and dominant watershed disturbances, Skookum Creek.

Characteristic or Indicator	Skookum Creek	NF Skookum
Physical Characteristics		
HUC	1701021618a	1701021618b
Drainage area	7.5	12.5
Sensitive landtypes	5%	14%
Sensitive snowpack	84%	75%
Qualifications		
Listed as Water Quality Limited	yes	No
Apparent watershed status	NPFC	65% FAR 35% NPFC
Hydrologic Regime		
Estimated peak flow	28	30
Current runoff modification	7%	17%
Equivalent clearcut area	8%	21%
Erosion and Sediment		
Estimated annual sediment	10.3	13.2
Current sediment load modification	227%	99%
Road density	4.6	5.4
Sensitive road density	0.5	0.3
Channel Conflicts		
Road encroaching at bankfull stage	0	0.4
Riparian road density	7	6.8
Stream Crossings		
Number of inventoried crossings	0	7
Risk of failure for inventoried crossings	0	5.9
Stream crossing frequency	1	1.7
Number of fish migration barriers	0	0

During stream and watershed surveys conducted in the fall of 1998, the reviewers agreed that the Skookum Creek drainage is a hydrologic system that is in a Not Properly Functioning Condition (NPFC). Like most of the drainages in the Newport planning area, the Skookum Creek watershed has mixed ownership. The stream condition is poor. The stream condition is evidenced by 1) the high levels of cobble embeddedness in the mainstem, 2) the large pulses of sediment moving through the channel and 3) a dense network of roads which are contributing large volumes of sediment to the stream.

Skookum Creek from its mouth to near Halfmoon Lake is listed by Washington State Department of Ecology as "Water Quality Limited" (303d) for fecal coliform (a bacteria). No other forks or tributaries are listed.

North Fork of Skookum Creek: The North Fork of Skookum Creek is divided into two parts -- one is located south of South Skookum Lake and the other is located north of South Skookum Lake. The portion of the North Fork of Skookum Creek that is located to the south of South Skookum Lake is not a properly functioning stream from an

aquatic standpoint. Like the mainstem of Skookum Creek, this tributary has elevated levels of cobble embeddedness and with storm events, large pulses of sediment reach the stream from the road systems. The North Fork of Skookum Creek (and its major tributary Split Creek) which is located to the north of the South Skookum Lake is in better condition. This tributary was surveyed and the reviewers suggested that it is an aquatic system that is functioning at risk (FAR). This portion of the Skookum Creek drainage is in relatively good shape, despite the dense road network and historical riparian harvesting.

Little Skookum Creek: The Little Skookum Creek tributary is not a properly functioning stream. Like the mainstem of Skookum Creek, this tributary has elevated levels of cobble embeddedness and with storm events, large pulses of sediment reach the stream from the road systems.

Sandwich Creek Watershed: This drainage was surveyed at the same time as the Cooks Creek drainage. (Field notes are available in the project file). Unlike the Cooks Creek watershed, the surveyors determined that Sandwich Creek was an aquatic system that was in a not properly functioning condition (NPFC). During the survey of the Sandwich Creek drainage it was noted that tremendous amounts of sediment were being directly delivered to the mainstem from a road located in the riparian zone. The channel has very poor structure and no resiliency to future impacts. There was no fish habitat in this stream.

Table III-254. Watershed characteristics, condition indicators, and dominant watershed disturbances, South Fork Skookum Creek subwatersheds.

Characteristic or Indicator	SF Skookum Creek [2]	Sandwich Creek
Physical Characteristics		
HUC	1701021618c	1701021618c
Drainage area	5.2	1.9
Sensitive landtypes	27%	16%
Sensitive snowpack	80%	43%
Qualifications		
Listed as Water Quality Limited	No	No
Apparent watershed status	FAR	NPFC
Hydrologic Regime		
Estimated peak flow	28	29
Current runoff modification	3%	4%
Equivalent clearcut area	6%	19%
Erosion and Sediment		
Estimated annual sediment	16.1	36.3
Current sediment load modification	58%	182 %
Road density	3.6	3.8
Sensitive road density	1.4	1.5
Channel Conflicts		
Road encroaching at bankfull stage	0.4	0.1
Riparian road density	5.2	11
Stream Crossings		
Number of inventoried crossings	0	1
Risk of failure for inventoried crossings	0	0.7
Stream crossing frequency	1.9	2.6
Number of fish migration barriers	0	0

South Fork of Skookum Creek: The South Fork of Skookum Creek is considered to be a basin that is functioning at risk. The risks in the watershed include existing road crossings and riparian modifications. The road related problems in the watershed could be remedied and then some of the in-stream sediment could be reduced. The stream channel is also adversely impacted by agriculture in the lower reaches just before it joins the mainstem of Skookum Creek.

The Skookum Creek watershed includes two small sub-basins that are not connected to Skookum Creek via overland flow. Water in these two sub-basins collects in lakes where it is presumed to move underground into Skookum Creek. Because of this hydrologic discontinuity, sediment generated in these sub-basins does not enter Skookum Creek.

Cooks Lake Basin: Most of the water in the basin flows north into Cooks Lake, but some flows south to an unnamed wetland. Water from Cooks Lake may flow underground to form Cooks Creek. This drainage was surveyed in 1998 as part of the Douglas-fir Beetle outbreak project. The surveyors only reviewed small portions of the stream throughout the basin. Nevertheless, the stream surveyors suggested that the stream was functioning at risk. Like so many of the other drainages in the Newport area, this basin has a mixed ownership of both federal and private lands. The stream channel has high levels of cobble embeddedness but overall the channel had very good structure.

Mystic Lake Basin: Mystic Lake basin is a small basin tributary to Mystic Lake. Water from Mystic Lake probably flows underground into the Cooks Lake basin. The tributaries flowing into Mystic Lake are considered to be functioning at risk (FAR). (Field notes are available in the project file). The surveyors based their call upon the field observations of the streams and existing road network in the Mystic Lake watershed. There are numerous opportunities to improve the existing conditions of the roads so as to minimize the sediment delivered to the tributary streams.

2 -- SF Skookum Creek above it's confluence with Sandwich Creek, Cooks Lake Basin and Mystic Lake basin.

The Southern Watersheds

Indian Creek Watershed: The Indian Creek drainage was surveyed in the fall of 1998. The surveyors suggested that given the existing aquatic conditions, that the stream is not properly functioning. Overall, the stream has very poor structure due to the lack of large woody debris and the lack of channel complexity. The existing roads are sources of large volumes of sediment to the channel. At the lower end of the drainage, the channel has been adversely impacted by agriculture, home development and cattle. Indian Creek is the only watershed in the Newport planning area that has bull trout.

Bead Lake Watershed: The review of the Bead Lake drainage included surveys of several unnamed tributaries as well as the mainstem of Lodge Creek and West Lodge Creek. The surveyors suggested that all of the surveyed streams were functioning at risk. The field data showed that although the streams had ongoing aggradation and degradation, that overall the streams were able to adapt. Opportunities exist to reduce the high density of roads in the headwaters surrounding Bead Lake.

Marshall Lake Watershed: Marshall Lake has two main tributaries -- Burnt Creek to the south and an unnamed tributary to the north. The unnamed tributary is considered to be functioning at risk (FAR). The mainstem appears to be experiencing elevated levels of scouring in some reaches and filling in others, but still has resiliency to disturbance. The active erosion and subsequent deposition may be a function of the historical, intense history of fire in the headwaters. Burnt Creek is in a properly functioning condition. The mainstem of Burnt Creek is stable and the watershed appears to have recovered from past wildfires. The survey team noted that the stream had large fish populations; most likely rainbow trout and westslope cutthroat trout. Marshall Creek below Marshall Lake was not surveyed or evaluated.

Table III-255. Watershed characteristics, condition indicators, and dominant watershed disturbances, southern watersheds.

Characteristic or Indicator	Indian Creek	Bead Lake	Marshall Lake
Physical Characteristics			
HUC	1701021619	1701021620	1701021621
Drainage area	6.3	10.2	4.6
Sensitive landtypes	11	26	25
Sensitive snowpack	12	73	82
Qualifications			
Listed as Water Quality Limited	No	No	No
Apparent watershed status	NPFC	FAR	FAR
Hydrologic Regime			
Estimated peak flow	24	28	28
Current runoff modification	14	11	20
Equivalent clearcut area	17	5	8
Erosion and Sediment			
Estimated annual sediment	12.9	11.1	13.4
Current sediment load modification	147%	43%	9%
Road density	4.1	3.1	3.2
Sensitive road density	0.5	1.6	0.1
Channel Conflicts			
Road encroaching at bankfull stage	0	0	0
Riparian road density	2.8	3.2	1
Stream Crossings			
Number of inventoried crossings	0	10	4
Risk of failure for inventoried crossings	0	3	2.2
Stream crossing frequency	1.1	0.7	0.2
Number of fish migration barriers	0	2	0

ENVIRONMENTAL CONSEQUENCES

The description of environmental consequences is divided into three sections. The first section describes the methodology used to estimate the effects of the alternatives, and the second discussed general effects of the proposed actions, and the third section describes the effects of the alternatives on water quality and watershed condition.

Methodology

For purposes of comparing alternatives and analyzing the effects of the several aspects of each alternative (which include, but are not limited to aquatic restoration activities), a table of watershed effects is presented. A table was developed for each analysis watershed. The methods used in this section are the same as were used in the Affected Environment.

The table consists of measurement indicators, followed by an estimate of that parameter at present; and then by the estimate of that parameter over the periods of time during and following the project under each alternative scenario. The table is followed by a narrative discussion of each analysis for direct, indirect, and cumulative effects in each watershed at each appropriate spatial and temporal scales.

Sediment load modification is a cumulative effects analysis tool that estimates the change in sediment load for the watershed. This analysis tool utilizes information about proposed timber harvest, fuel treatment, and road reconstruction to estimate sediment. It does not estimate the reduction in sediment from watershed restoration projects. The technique is discussed in the Affected Environment section. The modification is relative to the sediment load shown in the affected environment section. Because of the nature and locations of the proposed harvest and fuel treatment areas, and because no road construction is proposed, sediment load modification does not change much between alternatives. The model was run using 2006 as the target year. All harvest is expected to be completed by this year.

Runoff modification is a cumulative effects analysis tool that estimates the change in peak flow. The estimated peak month discharges for the watershed was calculated using the techniques described earlier. Peak flows are calculated for each alternative based on regeneration and selective harvest units proposed in each watershed. Flows are reported as cubic feet per second per square mile of watershed for the peak month and as a percent change from the effects in the affected environment. Again, because little regeneration harvest is proposed, the runoff modification does not vary much between alternatives. The model was run using 2006 as the target year; all harvest is expected to be completed by this year.

Change in stream crossings is the change in then number of known crossings. During the inventory phase, in the fall of 1998, some stream crossings were 'inventoried' and some where not. Crossings were generally inventoried when they were felt to be 'high risk' crossings, crossings with large fills. The **associated risk,** in terms of tons of sediment per year, was calculated based on inventoried crossings. These values can decrease due to watershed restoration actions. The reported number is the net change in the first five years, the highest risk period. Long term effects also evaluated and discussed in the narratives following the tables.

Change in road miles due to this project: Since the Newport planning area does not include road construction, this parameter displays the reductions in total road miles due to aquatic restoration projects. **Cumulative change in road miles:** In some watershed analysis areas, road construction from other projects is expected to occur between now and when the Douglas-fir beetle project would be implemented. In these watersheds the change in road miles from the existing condition may be positive, but it is NOT DUE TO THE DOUGLAS-FIR BEETLE PROJECT.

Change in encroaching roads: Since the Newport planning area does not include road construction, this parameter displays the reductions in encroaching road miles due to aquatic restoration projects.

<u>Watershed hydrologic response estimates and WATSED</u>

***Sediment load modification** and **runoff modification** serve as <u>relative indicators of potential hydrologic responses</u> in the watershed with a specified series of events. The indicators are a limited estimate of the expected relative cumulative watershed sediment budget. The estimate is derived from a model that compiles watershed responses that might result from forest management related disturbances (roading, logging, and burning) over time and space. The percent change estimates are relative to the expected "natural" sediment and peak flows in watersheds with similar geomorphology, climate, and land use. The magnitude of those "natural" values are shown in Existing Conditions section of this chapter, and they are used to characterize the undisturbed (by forest activities) watershed.*

The relative change for both "natural" parameters is by definition none, or zero percent. In most watersheds within this project, the relative changes for both parameters are greater than zero, since the lands involved have been actively managed in the past, and since the responses are calculated by a deterministic model. For perspective, the magnitudes of the two percent change values for each alternative (as well as the existing conditions) reflects a level of stress on the watershed and stream system that has been induced over time. Some watersheds are more resilient to these stresses, and that must be considered in the synthesis of effects that follow. The sediment and peak flow estimates are only part of the information necessary to evaluate effects. In addition, the difference between alternatives with respect to these two estimated response values is relative to the magnitude of the differences. Rarely in the region where this model was developed and is used, are differences in estimated sediment less than 10 to 20%, and peak flows less than 5% even detectable due to technical limitations in measurement and due to the natural variability of these parameters in any given watershed. And then, it appears that most streams and water resource uses usually do not respond measurably to those magnitudes of change unless, perhaps sustained for long periods.

The sediment and peak flow indicators reflect how watersheds with similar conditions and landtypes responded over time to a similar history of disturbance. The forest management activities used to calibrate the model included standard BMPs and Soil and Water Conservation Practices; therefore standard BMPs and Soil and Water Conservation Practices are necessary requirements for maintain an effective confidence level in the model's use. Non-standard practices, management or natural disturbances not related to forest practices, and site-specific non-standard BMPs, if and when they are incorporated into past, proposed, or foreseeable actions must be integrated into the final analysis of watershed response.

The modeled response variables are used to provide one basis for estimating effects of an alternative in this project. While associated road development and maintenance, logging, and prescribed burning are a source of one kind of disturbance, watershed restoration and mitigation are another. In order to demonstrate the potential effects of proposed restoration and mitigation actions in an alternative, four "net change" variables associated with the key restoration responses are used.

Models, such as WATSED, are usually designed to address and integrate a vast and complex number of conditions and organize their evaluation according to a rule sets established by the author. In the case of WATSED, the rule sets were based on research, and data and analysis collected locally. The models, however, also include simplifying assumptions, and they do not include all possible controlling factors. Therefore, the use of models is to provide one set of information to the technical user, who along with a knowledge of the model and its limitations, other models, data, analyses, experience, and judgement must integrate all those sources to make the appropriate findings and conclusions that follow.

Effects of the Alternatives

TYPICAL EFFECTS OF VARIOUS ACTIVITIES

This section describes typical effects from typical practices. Atypical practices or responses will be addressed in the specific watershed sections where they occur.

Effects of Removing Encroaching Roads

Removal of roads encroaching into streams probably have the most positive impact on watershed condition and stream function. All action alternative propose obliteration of 0.4 miles of encroaching road in the South Fork Skookum Creek watershed (Forest Road 1900016).

Effect on stream condition: Encroaching roads may occupy the active flood prone area associated with the stream, or the active channel itself with road fill. Those road sections reduce capacity of the stream at flood stages, alter flow patterns, increase local velocities, redistribute sediment loads, and compromise the function of the stream's riparian areas. During flood flows, the depth of flow is increased, and normal flow patterns are disrupted. This often causes scouring of opposing stream banks and undercuts opposing hillslopes, which in turn is an erosion source that increases sediment input into the stream. Sometimes the scour undercuts the opposing slope which destabilizes it and initiates a mass failure (such as a slump or debris avalanche) of material into the stream. In some cases, the road constricts the channel enough that the natural meanders are straightened and stream slope is steepened. This can result in rapid adjustments by the stream to regain its balance with the water flow and sediment load; the result is an unstable stream which would compromise the support of beneficial uses.

Effect on sediment: Roads located close to streams usually deliver more sediment to streams than other roads for two reasons: 1) roads in close proximity to streams are more likely to be subject to the erosive forces of running water; and 2) eroded materials do not have to travel far to be delivered to the streams. The closer a road is to the stream, the smaller the expanse of forest floor and its rough materials available to capture and store sediment.

Removal of encroaching roads reduces sediment delivery in the short and long term. Improvement in stream condition and habitat in terms of clarity, accumulation of sediment, loss of cover, erosive velocities, etc., is expected at the road removal site and immediately downstream. The extent of this response is limited by upstream inputs to the local reach; but a local encroaching road often dominates the adjacent and the downstream reach.

During and after road removal, some fine sediment would likely be delivered to the water. Best Management Practices include silt fences, mulch, coffer structures to dewater the work site, and other erosion control techniques would minimize the amount of sediment delivered in the short term, and the seeding or planting to re-establish of effective vegetation; thereby reducing long-term sediment inputs. The majority of sediment delivered to the stream when a road is removed is in the form of suspended sediment. The suspended sediment routes through the stream system quickly and the primary effect is often turbidity (loss of clarity of the water). The increase in turbidity would be measurable for a short time immediately following disturbance and would be evident for short distances downstream from the fill removed (generally less than 1,000 feet). The amount of sediment lost from road fill removal is low, especially when compared to the long term reduction realized; and it rarely is responsible for alteration of stream stability or substrate composition.

General Effects of Road Reconstruction Activities

All action alternatives include both light and heavy road reconstruction in all watersheds. Some of this reconstruction is specifically for watershed restoration purposes and some is for access. Chapter II shows the road reconstruction proposed. In general, all road reconstruction would include road surface replacement,

installation and/or reshaping of drainage structures like rolling dips, and replacement/resizing of culverts (if needed). The Best Management Practices in chapter 2 discuss some general guidelines for reconstruction of roads.

Road surfacing: Road surface treatments, such as application of gravel, can reduce sediment delivered to streams by reducing the amount of sediment eroded from the road surface. All reconstruction would require additional road surfacing where needed. In general, all rolling dips would be rocked unless there is sufficient rock in the roadbed material to resist erosion.

Stream crossing or pipe upgrades: In the process of inventorying roads for watershed restoration one culvert was identified and inventoried as needing upgrading to a larger size. This culvert is located on the Bear Paw road (FR5015020) in the North Fork Skookum Creek watershed (Little Skookum subbasin). Risk in this context is a function of the chance of failure and the cost (or damage) associated with that failure. The chances of failure are controlled by the design of the structure, and the frequency of certain flood events. The cost of failure is visualized as the amount of sediment eroded from the fill and delivered to the stream; and the response of the stream and water quality. The stream response can vary from turbidity, to deposition and loss quality of habitat, to entrainment of channel material, debris flows, and loss of habitat and decreased channel stability. Increasing the size of a culvert or the crossing structure, or removing the drainage structure reduces the chance that a fill may fail as a result of lack of capacity. Providing flow relief or overflow conveyances in the event of loss of capacity from excess streamflows or blockages also reduces the chance of failure. It also reduces the actual cost of failure by creating a more stable crossing under flood events.

Stream crossing maintenance or upgrade: Regular maintenance of stream crossings would reduce sediment delivery to streams. Additional cross drainage structures installed away from the live stream would capture sediment coming from the road surface and ditch and reroute it to the forest floor. This would not eliminate sediment delivery, but would reduce the amount currently delivered to the stream.

Installation of relief culvert crossings: The need for additional relief structures for watershed restoration purposes was identified on most roads in all watersheds. Installation of relief culverts would reduce the timing, magnitude and quantity because surface runoff from the ditch line would be dispersed and allowed to infiltrate into the forest floor. The dispersion of surface runoff would help "normalize" the flow regime of a basin by recharging the groundwater. The groundwater would slowly release into the live streams.

Increased Sediment due to Road Use

Use of roads for haul would increase sediment delivered to streams during and for a short time after haul. The heavy use of vehicles, mainly logging trucks, on the road surface and frequent surface blading of the road increases the amount of sediment eroded during summer rainfall events. Some of this sediment may be delivered where the road is near the stream or when runoff is carried down a ditch line to a stream.

Stream Crossing Failures on Abandoned or Unmaintained Roads

In the inventory phase, no specific unmaintained or abandoned roads were identified where stream crossing failures appeared likely. The majority of these roads are stabilized with vegetation, and are not actively delivering sediment to stream channels. Although often brushed in, many of these roads may still have culverts and fills at stream crossings. Structures in streams will eventually fail. Typically in older road designs, they are designed for a useful life of 20 years, including the crossing structures themselves. Abandoned and unmaintained roads have been, and can be expected to fail over time. These failures are usually associated with relatively infrequent hydrologic and climatic events. A typical example is when warm, moisture-laden air masses move into the region over a watershed that is dominated by a ripe snowpack (near freezing temperature and loaded with water), that is ready to melt. The results are often a rapid and flashy runoff that is referred to as a "rain-on-snow" flood. During these events, water flow can exceed the capacity of the crossing structure (such as a culvert pipe or bridge), or debris would be mobilized

which blocks the inlet. The water rises and overtops the fill, eroding it (often en masse), depositing the material into the creek. In some locations, pore water pressure in the soil actually destabilizes the fill material and the hillslope, causing them to slump.

Effects of Stream Crossing Failures on Sustained Grade Roads

Stream crossings on steep sustained grades are sometimes inadvertently installed so that the road actually captures stream flow if a culvert or crossing cannot carry all the flood flow. The structure can be blocked by debris or its capacity somehow is exceeded. At these crossings, one approach of the road is lower than the road surface at the stream crossing as the road continues down hill. When the culvert fails or its capacity is exceeded, the water overtops the pipe and begins flowing down the road. Instead of flowing directly over the road and back into the channel, it flows downslope on the road or in the ditch line until an obstruction, such as a low point in the road, forces the flow across the road surface and onto the fill. The Newport planning area has three roads with this kind of sustained grade – the Bear Paw Road (FR5015020), Bead Ridge Road (FR3215), and the Mystic Lake Road (CR3318). All three roads are slated for reconstruction under some action alternatives to improve drainage, thereby reducing the risk of extensive damage from a culvert failure.

The water flowing down the road often erodes the road surface, causing gullies in the road tread, road fill and the slope below the fill as the water travels back to the stream. The amount of sediment delivered to the stream from this type of erosion would exceed the amount of sediment delivered should just the crossing fail. Because when the stream travels down the road, the sediment eroded includes loss from the crossing, the ditch line, the road prism and the fill. In some cases, failure of a crossing and subsequent overflow can initiate mass failure of the hillslope above the failure.

Flow relief drivable and hardened dips can be installed at stream crossings where flows could escape as described down the road. This would reduce the amount of sediment delivered to the stream for the long term. Some sediment may be delivered to the stream during installation of the dips, but the amount would be small and not expected to reduce water quality or alter stream condition.

General Effects of Stream Crossing and/or Large Fill Failures

When large roadfills fail, such as at stream or draw crossings, or at encroaching roads, they often inundate the stream with quantities of sediment that cannot easily be flushed through the stream. The deposited materials tend to remain intact as a mass of sediment or a 'slug' of sediment that can severely alter smaller streams by filling both channel pools and flood prone areas. The result is a loss or inhibition of important channel elements and functions that are necessary to retain the dynamic equilibrium of the stream and to support beneficial uses of the water. As the sediment mass moves down stream and enters larger streams, the sediment begins to disperse, thereby reducing the channel effects of the single failure. Multiple failures combine and result in long term adverse channel effects downstream.

Sediment Delivery from Timber Harvest and Fuel Reduction Activities

No sediment is expected to be delivered to streams from logging, yarding, or fuel treatment activities because of the implementation of BMPs (described in Chapter II), and due to their location beyond the riparian areas of streams or lakes. None of the alternatives propose harvest or fuel treatments in the Riparian Habitat Conservation Areas as described in the Inland Native Fish Strategy. These wide buffers are expected to be very effective in trapping any sediment generated by the upland activities (Belt et al. 1992). All landings are located outside of RHCAs and they are designed to minimize the risk of sediment delivery and prevent mass failure potential (BMP).

Effects on Tree Mortality, Timber Harvest and Road Work on Stream Temperatures

Stream temperature is not expected to change at either the tributary or watershed scale. Since no harvest would in Riparian Habitat Conservation Areas, neither shade nor stream cover would be affected under any action alternative. Some trees that are currently providing shade to streams have already died or may die soon as a result of the Douglas-fir beetle attack. The loss of shade from this mortality is not expected to increase water temperatures locally or downstream due to one or more of the following: high mixing capacity of most mountain streams, inflow of subsurface water, and/or the low amount mortality of shade trees in riparian areas. Therefore, none of the alternatives is anticipated to impact stream temperature either individually or cumulatively.

Effects of Tree Mortality on Flow Regimes

Some local change in the timing, and an increase in the magnitude and quantity of flows is expected under all alternatives, primarily in local small (less than 1,000 acres) headwater basins. The increase in flow is primarily due to the tree mortality due to the Douglas-fir beetle. Additional mortality due to the harvest of non-infested nearby timber is not expected to increase measurably the magnitude or quantity of flows because of the wide dispersion of sites throughout the area and the relatively low intensity of treatments in most stands. No measurable differences are expected to occur between alternatives. As a result, no measurable effects are expected to stream channel conditions, locally or downstream. Local stream conditions are stable and are expected to be remain resilient to any local changes in runoff generated by the project.

Effects of Timber Stand Improvement Projects

Timber stand improvement projects such as pre-commercial thinning and pruning are not ground disturbing activities, and therefore have no impact on sediment. Because of the small size of the material being cut, these activities also have no impact on water yield, peak flows or stream conditions.

In the following sections, treatment acres have been rounded to the nearest 10. Values that would be rounded to zero are described as "less than 5 acres".

Effects of the Alternatives on the Pend Oreille Face Watersheds

Cumulative Watershed Scale Effects

The Pend Oreille Face is an analysis area composed of three analysis areas. The Pend Oreille River is a Water Quality Limited stream adjacent to the analysis areas. The pollutants of concern for this reach of the Pend Oreille River are temperature, pH, and exotic aquatic plants. As discussed in the typical effects section, none of the alternatives would impact stream temperatures. Therefore, none of the action alternatives would contribute to the pollutants that caused it to be listed. Nor would any alternative compromise any future restoration strategy that may be developed for this Water Quality Limited Stream.

No short- or long-term effects to beneficial uses are expected at the Pend Oreille River scale. As modeled and shown on the tables, there would be no increase in either sediment load or peak flows due to timber management or fuel treatments (effects in Section 15 are not tributary to the river). Proposed watershed improvement projects would have a negligible effect at the Pend Oreille River scale.

Direct and Indirect Tributary and Localized Scale Effects

Furport Analysis Area

This analysis area is near the town of Furport on the Pend Oreille River. Historically, this parcel of land has been heavily logged and roaded. The largest stream draining the analysis area flows subsurface prior to reaching the Pend Oreille River.

Alternatives D and F would harvest about 270 acres using selective harvest and a combination of tractor and helicopter yarding systems. Alternatives B, C and E harvest about 50 acres also using selective harvest and tractor yarding systems. Alternative G proposes to burn about 270 acres. For alternatives D and F, about 30 acres of tractor harvest are located in landtypes with a high potential for sediment delivery. Alternatives B, C, and E have about 20 acres of tractor harvest are located in landtypes with a high potential for sediment delivery.
At the local scale, all of the proposed harvest and burning activities are located in the subbasin of the stream that flows subsurface before reaching the Pend Oreille River. Therefore none of the proposed actions would have a direct effect on the Pend Oreille River. For the tractor harvest areas, Best Management Practices including limiting the slopes that can be logged with a tractor, limiting the number of skid trails, and seeding disturbed ground, would reduce sediment potential from this harvest. The riparian buffers would be at least 150-feet wide, and slopes are gentle. As described in the typical effects section, sediment generated in these harvest areas is not likely to enter the nearby stream.

Under action alternatives D, F and G, the National Forest roads that are most adversely impacting water resources would be reconstructed (FR1914 and FR1914120). As described in the typical effects section, reconstruction of these roads would improve drainage and surfacing. Surfacing would be the most important improvement in this area, and would decrease sediment in the long-term. The effects of the restoration projects are not included in the sediment model.

Table III-256. Projected watershed response in the Furport area, by alternative.

WATERSHED NAME: Pend Oreille Face							AREA: Furport Area
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	114	114	114	114	114	114	114
Runoff modification (%)	7	7	7	7	7	7	7
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	0	0	0	0	0	0
Change in roads (miles)	0	0	0	0	0	0	0
Change in encroaching road (miles)	0	0	0	0	0	0	0

Geophysical Analysis Area

This analysis area is located between Indian Creek and Marshall Creek. Most of the analysis area is a large outwash terrace; there are few streams and most of the streams go subsurface before reaching the Pend Oreille River. Alternatives D and F propose to harvest about 70 acres of selective harvest (removal of dead trees only) using a combination of helicopter and skyline yarding systems. Alternatives B, C and E propose to harvest less than 5 acres of selective harvest using skyline yarding systems. Alternative G proposes to burn about 70 acres. Because the streams in this area go subsurface before entering the Pend Oreille River, the sediment delivery potential to the River is nil from these areas. At the local scale, the sediment delivery potential is low and the risk of mass wasting is low for all areas. Selective harvest, when combined with the helicopter and skyline yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows.

All action alternatives propose to obliterate 0.8 miles of road (FR3215071). In this analysis area, this road is located high in the watershed, only 1 stream crossing would be removed. As described in the typical effects section, obliteration of the road and removal of the culvert would increase sediment for a short time but decrease sediment in the long-term. This would impact an unnamed stream that does not flow to the Pend Oreille River. Therefore, this improvement would not effect water quality in the Pend Oreille River. The effects of this restoration project are not included in the sediment model.

Table III-257. Projected watershed response in the Geophysical area, by alternative.

WATERSHED NAME: Pend Oreille Face						AREA: Geophysical area	
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	22	22	22	22	22	22	22
Runoff modification (%)	1	1	1	1	1	1	1
Change in stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
Cumulative change in roads	0	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
Change in encroaching road	0	0	0	0	0	0	0

Section 15 Analysis Area

This analysis area is located east of the Geophysical analysis area – between Bead Lake and Marshall Lake watersheds. The analysis area consists of mountain slopes. Streams forming in this area flow into the outwash terrace that is the Geophysical analysis area where they go subsurface. None of the streams in this analysis area reach the Pend Oreille River. Alternatives D and F propose to harvest about 100 acres -- about 50 acres of selective harvest using a combination of helicopter, skyline and tractor; and about 50 acres of regeneration harvest using helicopter yarding systems. Alternative G proposes to burn about 20 acres.

At the local scale, all ground disturbing activities are proposed on landtypes with a low sediment delivery potential and a low risk for mass wasting. Best Management Practices including limiting the slopes that can be logged with a tractor, use of water bars, limiting the number of skid trails, and seeding disturbed ground, would reduce sediment potential from the tractor harvest unit. The riparian buffers would be at least 150 feet. As described in the typical effects section, sediment generated in these harvest areas is not likely to enter the nearby stream. The selective harvest, when combined with the helicopter and skyline yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield or sediment delivery. The regeneration harvest is to be yarded with a helicopter. As discussed in the typical effects section, this unit would not increase sediment in the stream. Because of the limited amount of regeneration harvest, no change in peak flows would occur. Because the streams in this area go subsurface before entering the Pend Oreille River, the sediment delivery potential to downstream beneficial uses or the River is nil from these areas.

All action alternatives propose to reconstruct the Bead Ridge Road (FR3215). This road crosses live one perennial stream. As described in the typical effects section, reconstruction of the road would increase sediment for a short time but decrease sediment in the long-term. This road has a sustained grade, and reconstruction that installs additional rolling dips and relief culverts would reduce the risk of substantial amounts of sediment entering this creek. All action alternatives also include obliteration of about 0.3 miles of FR 3215071. This road has one crossing on an unnamed stream. Both improvements are located the same unnamed streams that does not flow into the Pend Oreille River. Therefore, these improvements would not effect water quality in the Pend Oreille River. The restoration projects are not included in the sediment model.

Table III-258. Projected watershed response in the Section 15 Creek, by alternative.

WATERSHED NAME: Pend Oreille Face						AREA: Section 15 Creek	
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	61	61	61	61	61	61	61
Runoff modification (%)	8	8	8	9	8	9	8
Change in stream crossings (#)	0	-1	-1	-1	-1	-1	-1
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Change in roads (miles)	0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Change in encroaching road (miles)	0	0	0	0	0	0	0

Effects of the Alternatives on the CCA Creek Watersheds

Two principle tributaries to CCA Creek, Browns Creek and Half Moon Creek, are within the Newport planning area.

Cumulative or Watershed Scale Effects

No short-term or long-term effects to beneficial uses are expected at the watershed scale. The watershed is generally functioning adequately. As modeled and shown on the tables, there would be no increase in either sediment load or peak flows due to timber management or fuel treatments. Proposed watershed improvement projects would have a negligible effect on the watershed scale. The cumulative effects analyses indicate there have been elevated sediment load and peak flows from past forest practices and roads. The watershed is currently experiencing a recovery from these past activities. None of the alternatives would increase the recovery rate, nor would they retard the recovery. Overall watershed condition would continue to improve to as impacts from past forest management practices continue to heal.

Direct and Indirect Effects at the Tributary and Localized Scales

Browns Creek

About 250 acres of selective harvest using a helicopter are proposed in the Browns Creek watershed in Alternatives D and F. The harvest areas are located near the ridge, in an area with a low potential for sediment delivery and a low risk for mass failures. The type of selective harvest, when combined with the helicopter yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows.

There is one restoration activity planned under all action alternatives, reconstruction of a portion of Forest Road 1921. The New Moon Ecosystem Analysis identified this road as a major sediment source in this watershed. Reconstruction would include rock and improvement of drainage. As described in the typical effects section, reconstruction may increase sediment in the short-term as culverts are replaced, but would reduce sediment in the long-term.

Runoff patterns within Browns Creek have been altered somewhat due to past disturbances. The trend in water yield as measured by peak flow modification, is decreasing slowly within the drainage as the vegetation has become reestablished. This improving trend would not be compromised by any alternative. Sediment load in the basin, as measured by sediment load modification, would continue to decrease. Overall, the channel is stable and is expected to remain stable.

Table III-259. Projected watershed response in the Browns Creek Watershed, by alternative.

WATERSHED NAME: CCA Creek						TRIBUTARY: Browns Creek	
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification(%)	52	52	52	52	52	52	52
Runoff Modification (%)	11	11	11	11	11	11	11
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	0	0	0	0	0	0
Cumulative change in roads (miles)	0	0	0	0	0	0	0
Change in encroaching roads (miles)	0	0	0	0	0	0	0

Half Moon Creek

Alternatives D and F propose to harvest about 130 acres using selective harvest with helicopter and skyline yarding systems. Alternatives B, C, and E propose to harvest 90 acres using selective harvest with helicopter and skyline yarding systems. Alternative G proposes to burn about 130 acres. All of the proposed treatment areas have a low sediment delivery potential and a low risk for mass failure. The type of selective harvest, when combined with the helicopter and skyline yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows.

There is one restoration activity planned under all action alternatives, reconstruction of a very small portion of Forest Road 1921. Because of the very small amount of reconstruction, it would have no effect on sediment at the tributary scale.

Runoff patterns within the Half Moon drainage have been altered somewhat due to past disturbances. The trend in water yield is decreasing within the drainage as the vegetation has become reestablished. Slight increases in peak flows may occur within Half Moon Creek as a result of this activity may occur. Any such response would be short-lived and would have no effect on water resources, channel conditions, or beneficial uses. No increase in sediment delivered to any tributary is expected from yarding, landing construction or use. There is one restoration activity planned to occur in this drainage under any action alternatives, reconstruction of Forest Road 1921. Therefore there should be no effect to water resource values at risk.

Table III-260. Projected watershed response in Half Moon Creek, by alternative.

WATERSHED NAME: CCA Creek						TRIBUTARY: Half Moon Creek	
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	34	34	34	34	34	34	34
Runoff modification (%)	11	11	11	12	11	12	11
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	0	0	0	0	0	0
Cumulative change in roads (miles)	0	0	0	0	0	0	0
Change in encroaching road (miles)	0	0	0	0	0	0	0

Effects of the Alternatives on the Skookum Watersheds

Skookum Creek is a very large complex watershed that dominates the Newport planning area. Shortly above its confluence with the Pend Oreille River, Skookum Creek divides into two principle forks, and both of those forks split again into large tributary watersheds. For purposes of this analysis the three main, and one small tributary are addressed: 1) main Skookum Creek above North Fork Skookum Creek; 2) North Fork Skookum Creek; 3) upper South Fork Skookum Creek including Cooks Lake Creek and Mystic Lake; and 4) Sandwich Creek. Sandwich Creek was not analyzed with the South Fork Skookum because it enters the creek so close to the South Fork's confluence with Skookum Creek. Halfmoon Lake basin was included with the Skookum Creek watershed for this analysis.

Cumulative Watershed Scale Effects

No short-term or long-term effects to beneficial uses are expected at the watershed scale. Overall the watershed is appears to be generally functioning at risk due the adverse effects of sediment which contribute to cobble embeddness and simplification of channel structure. Some segments (Skookum Creek and portions of the North Fork Skookum Creek) were identified as not properly functioning. As modeled and shown on the tables, there would be a slight increase in sediment load due to these proposals. As discussed earlier, while the model used predicted a minor change in sediment and peak flows, these differences would not be measurable or noticeable at either the watershed or tributary scale.

Proposed watershed improvement projects would be noticeable at the tributary scale, but would have a negligible effect on the watershed scale.

The cumulative effects analyses indicate there have been elevated sediment load and peak flows from past forest practices and roads. Continuing sediment inputs, primarily from roads, continue to inundate the stream inhibiting it's full recovery. None of the alternatives would increase the recovery rate, nor would they retard recovery at the watershed scale. Overall watershed condition would continue to improve to as impacts from past forest management practices continue to heal.

Direct and Indirect Effects at the Tributary and Localized Scales

<u>Skookum Creek above North Fork Skookum Creek</u>

Skookum Creek is listed on the 303(d) list of fecal coliform. A 1995 study by the Pend Oreille Conservation District found that cattle on private lands were the source. There is no livestock grazing on National Forest lands in Skookum Creek or anywhere in the Newport planning area. Therefore, none of the alternatives would contribute to the pollutant that caused Skookum Creek to be listed.

This tributary has been subject to considerable disturbance over a long period of time. Kings Lake Road (CR3389) and Forest Road 5030 follow the stream for most of it's length. While both of these roads are surfaced with gravel, both roads have a relatively high level of use and are suspected to be a significant source of sediment in this tributary watershed. Sediment delivery and movement through the system is currently elevated. Overall, this stream was identified as not properly functioning due to cobble embeddedness.

The effects of all the alternatives is essentially the same. As modeled, none of the alternatives increase sediment load or peak flows. Alternatives B, C, D, and E propose about 140 acres of selective harvest using a combination of helicopter and skyline yarding systems. Alternative F proposes about 130 acres of selective harvest using a combination of helicopter and skyline yarding systems. Alternative G proposes 80 acres of prescribed burning. All of the proposed activities are located in landtypes with a low potential for sediment delivery and a low risk of mass failure. As described in the typical effects section, the type of selective harvest, when combined with the helicopter and skyline yarding system and the wide riparian buffers, would

have a very minimal impact on sediment yield, sediment delivery, or peak flows. None of the alternatives include watershed restoration projects in this tributary. None were identified during the survey phase.

About 0.4 miles of new road would be constructed under the Bearfoot timber sale on National Forest lands. All of these roads are at or near ridgetops with no stream crossings. The increase in sediment load modification between the affected environment and the following table is due to this road construction.

Runoff patterns within Skookum Creek have been altered somewhat due to past disturbances. The trend in water yield as measured by peak flow modification, is decreasing slowly within the drainage as the vegetation has become reestablished. This improving trend would not be compromised by any alternative. Sediment load in the basin, as measured by sediment load modification, is currently very high. Sediment is decreasing slightly, and would continue to decrease. Overall, the channel is stable and is expected to remain stable.

Table III-261. Projected watershed response in the Skookum Creek Watershed

WATERSHED NAME: Skookum Creek	TRIBUTARY: Skookum Creek above North Fork Skookum Creek						
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	264	264	264	264	264	264	264
Runoff modification (%)	7	7	7	7	7	7	7
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	0	0	0	0	0	0
Cumulative change in roads (miles)	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4
Change in encroaching road (miles)	0	0	0	0	0	0	0

__North Fork Skookum Creek__

This tributary has been subject to considerable disturbance over a long period of time. County Road 3407 follows the lower part of the stream for about 2.5 miles. The road is partially surfaced with gravel and receives a high level of use due to the homes along the road. This road is suspected to be a significant source of sediment in this tributary watershed. In addition, a culvert failure precipitated a landslide on the Bear Paw road (FR5015020) in the spring of 1997 which deposited sediment into the North Fork of Skookum Creek. Sediment delivery and movement through the system is currently elevated. Overall, portions of this stream were identified as not properly functioning due to cobble embeddedness and sediment.

The effects of all the alternatives is essentially the same. As modeled, none of the alternatives increase sediment load or peak flows. Alternatives B, C, and E propose about 280 acres of selective harvest using mostly helicopter with a small amount of skyline yarding systems. Alternative D proposes about 460 acres of selective harvest using mostly helicopter with a small amount of skyline and tractor yarding systems. Alternative F proposes about 440 acres of selective harvest using mostly helicopter with a small amount of skyline and tractor yarding systems. Alternative G proposes 80 acres of prescribed burning.

At the local scale, all ground disturbing activities are proposed on landtypes with a low sediment delivery potential and a low risk for mass wasting. As described in the typical effects section, the type of selective harvest, when combined with the helicopter and skyline yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows. Alternatives D and F propose about 100 acres of tractor yarding in the upper portion of the watershed. Best Management Practices including limiting the slopes that can be logged with a tractor, use of water bars, limiting the number of skid trails, and seeding disturbed ground, would reduce sediment potential from the tractor harvest unit. The riparian buffers would be at least 300 feet. As described in the typical effects section, sediment generated in these harvest areas is not likely to enter the nearby streams.

Aquatic restoration projects in this tributary include reconstruction of the Bear Paw Road (FR5015020). In addition to replacing the culvert that failed in 1997 with a larger culvert, the reconstruction would improve drainage on a road with a sustained grade. As described in the typical effects section, replacing this culvert would increase sediment in the short-term, but reduce the risk of future failures thereby reducing the risk of large increases in sediment in the long-term. Also, as described in the typical effects, section, improving drainage on a sustained grade road would reduce the risk of future failures along this road, thereby reducing long-term sediment inputs. The second restoration project is reconstruction on County Road 3407. Reconstruction would include surfacing and improved drainage. Together, these would reduce the long-term sediment yield from this road. The effects of these restoration projects are not included in the sediment model.

About 0.7 miles of new road would be constructed under the Bearfoot timber sale on National Forest lands. All of these roads are at or near ridgetops with no stream crossings. The increase in sediment load modification and runoff modification between the affected environment and the following table is due to this road construction.

Runoff patterns within North Fork Skookum Creek have been altered somewhat due to past disturbances. The trend in water yield as measured by peak flow modification, is decreasing slowly within the drainage as the vegetation has become reestablished. This improving trend would not be compromised by any alternative. Sediment load in the basin, as measured by sediment load modification, would continue to decrease. In the long-term, all alternatives would reduce sediment, thereby enhancing the recovery taking place in this tributary. Overall, the channel is stable and is expected to remain stable.

Table III-262. Projected watershed response in the North Fork Skookum Creek Watershed

WATERSHED NAME: Skookum Creek				TRIBUTARY: North Fork Skookum Creek			
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	110	110	110	110	110	110	110
Runoff modification (%)	13	13	13	14	13	14	13
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	0	0	0	0	0	0
Change in roads (miles)	+0.7	+0.7	+0.7	+0.7	+0.7	+0.7	+0.7
Change in encroaching road (miles)	0	0	0	0	0	0	0

South Fork Skookum Creek:
This tributary has been subject to moderate disturbance over a long period of time. The stream was identified as functioning at risk due to cobble embeddedness and sediment. This analysis area includes three sections which are not connected by surface water – Mystic Lake and Cooks Lake basins. These areas were modeled together.

Alternatives B, C, and E propose about 80 acres of selective harvest using a combination of helicopter and skyline yarding systems. Alternative D proposes about 580 acres of selective harvest using helicopter, skyline and tractor yarding systems. Alternative F proposes about 420 acres of selective harvest using helicopter, skyline and tractor yarding systems. Alternative G proposes 240 acres of prescribed burning.

At the local scale, all ground disturbing activities are proposed on landtypes with a low sediment delivery potential and a low risk for mass wasting. As described in the typical effects section, selective harvest, when combined with the helicopter and skyline yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows.

Alternatives D and F propose about 330 acres of combination helicopter and tractor yarding in the Cooks Lake basin. As modeled, these alternatives increase sediment in this basin. Best Management Practices

including limiting the slopes that can be logged with a tractor, use of water bars, limiting the number of skid trails, and seeding disturbed ground, would reduce sediment potential from the tractor harvest unit. The riparian buffers would be at least 150 feet. As described in the typical effects section, sediment generated in these harvest areas is not likely to enter the nearby streams. If any sediment were generated and delivered from this activity, it would not reach Skookum Creek or South Fork Skookum because of the nature of the closed basin.

Aquatic restoration projects in this tributary area include obliteration of about 1 mile of road (FR 1900016) along SF Skookum Creek, obliteration of 0.4 miles of road (non-system road off FR 5015) in the Cooks Lake basin, and reconstruction of parts of County Road 3318 in the Mystic Lake basin. Reconstruction of CR 3318 and obliteration of the non-system road would only occur in alternatives D, F and G.

Forest Road 1900016 is a lightly used road in the riparian zone along the South Fork Skookum Creek, about 0.4 miles of the road are encroaching on the stream channel. The non-system road off FR 5015 is a riparian road that is currently not drivable. Very small portions of this road are encroaching on an unnamed stream that flows into Cooks Lake. Sediment from the road enters the stream during high flows. The typical effects section describes the benefits to be derived from removal of encroaching roads. Sediment would increase temporarily during the obliteration, but would decrease in the long-term by the removal of the road. CR 3318 is a road with a sustained grade. As described in the typical effects section, improving drainage on a sustained grade road would reduce the risk of future failures along this road, thereby reducing long-term sediment inputs. Sediment from this road would enter Mystic Lake or Cooks Lake. The effects of these restoration projects are not included in the sediment model.

About 1 mile of new road would be constructed under the Bearfoot timber sale on National Forest lands. All of these roads are at or near ridgetops with no stream crossings. The increase in sediment load modification and runoff modification between the affected environment and the no action alternative on the following table is due to this road construction.

Runoff patterns within South Fork Skookum Creek have been altered somewhat due to past disturbances. The trend in water yield as measured by peak flow modification, is decreasing slowly within the drainage as the vegetation has become reestablished. This improving trend would not be compromised by any alternative. Sediment load in the basin, as measured by sediment load modification, would continue to decrease. In the long-term, all alternatives would reduce sediment in South Fork Skookum Creek. Alternatives D, F and G would also reduce sediment in the Cooks Lake and Mystic Lake basins. This reduction in sediment would enhance the recovery taking place in this tributary area. Overall, the channel is stable and is expected to remain stable.

Table III-263. Projected watershed response in the South Fork Skookum Creek, by alternative.

WATERSHED NAME: Skookum Creek				TRIBUTARY: South Fork Skookum Creek			
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	89	93	93	108	93	93	89
Runoff modification (%)	5	5	5	5	5	5	5
Change in stream crossings (#)	0	-1	-1	-2	-1	-2	-2
Associated risk (tons/year)	0	0	0	-1	0	-1	-1
Change in roads due to this project	0	-1.0	-1.0	-1.4	-1.0	-1.4	-1.4
Cumulative change in roads (miles)	+1.0	0	0	-0.4	0	-0.4	-0.4
Change in encroaching road (miles)	0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Sandwich Creek above Cooks Creek

This tributary has been subject to significant disturbance over a long period of time. The district biologist believes the creek may have been 'straightened' in the early part of this century, though there is no evidence to support this in the historic record. The stream was identified as functioning at risk due to cobble embeddedness, the lack of channel structure, and the lack or large woody material.

Alternatives B, C, D, E, and F propose about 190 acres of selective harvest using a combination of helicopter and tractor yarding systems. Alternative G proposes about 190 acres of prescribed burning. At the local scale, all ground disturbing activities are proposed on landtypes with a low sediment delivery potential and a low risk for mass wasting. As described in the typical effects section, selective harvest, when combined with the helicopter yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows. Best Management Practices including limiting the slopes that can be logged with a tractor, use of water bars, limiting the number of skid trails, and seeding disturbed ground, would reduce sediment potential from the tractor harvest unit. The riparian buffers would be at least 300 feet. As described in the typical effects section, sediment generated in these harvest areas is not likely to enter the nearby streams. As modeled, this activity would not increase sediment or peak flows.

Aquatic restoration projects in this tributary area include reconstruction of parts of Forest Road 1900016, 1900036 and 1900039. All of these are lightly use, native surface roads in or near riparian areas. None are considered encroaching roads. Reconstruction of these roads would include surfacing and improvement of drainage -- both of which would reduce sediment in Sandwich Creek. The typical effects section describes the benefits to be derived from this activity. Sediment would increase temporarily during the reconstruction, but would decrease in the long-term. The effects of these restoration projects are not included in the sediment model.

About 0.2 miles of new road would be constructed under the Bearfoot timber sale on National Forest lands. The road is at or near ridgetops with no stream crossings. The increase in sediment load modification and runoff modification between the affected environment and the no action alternative on the following table is due to this road construction.

Runoff patterns within Sandwich Creek have been altered somewhat due to past disturbances. The trend in water yield as measured by peak flow modification, is decreasing slowly within the drainage as the vegetation has become reestablished. This improving trend would not be compromised by any alternative. Sediment load in the basin, as measured by sediment load modification, would continue to decrease. In the long-term, all alternatives would reduce sediment in Sandwich Creek. This reduction in sediment would enhance the recovery taking place in this tributary area. Overall, the channel is stable and is expected to remain stable.

Table III-264. Projected watershed response in Sandwich Creek above Cooks Creek, by alternative.

WATERSHED NAME: Skookum Creek Basin				TRIBUTARY: Sandwich Creek above Cooks Creek			
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	183	183	183	183	183	183	183
Runoff modification (%)	5	5	5	5	5	5	5
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	0	0	0	0	0	0
Cumulative change in roads (miles)	+0.2	+0.2	+0.2	+0.2	+0.2	+0.2	+0.2
Change in encroaching road (miles)	0	0	0	0	0	0	0

Effects of the Alternatives on the Southern Watersheds

The southern watersheds are Bead Lake, Indian Creek and Marshall Creek. There is no surface connection between Bead Lake basin and Indian Creek due to drifted outwash tills from historic glacial lake failures upstream. Although Bead Lake may be a subsurface source to Indian Creek, the two have been analyzed as two separate and independent systems. The Marshall Lake watershed is a small lake basin with a two main tributary streams and an outlet into Marshall Creek. The basin includes a complex of wetlands developed on ancient lake bed deposits. Marshall Creek (the outlet) originates from the lake and flows about 2 miles to the Pend Oreille River. The effects are described for Marshall Lake, the Marshall Creek watershed below Marshall Lake was not analyzed because it does not contain National Forest lands and the impacts described would not be apparent past the lake.

Neither Bead Lake, Indian Creek or Marshall Creek, or any of their tributaries are listed as Water Quality Limited. Indian Creek and Marshall Creek flow into a reach of the Pend Oreille River that is listed for temperature, pesticides, pH, and exotic aquatic plants; however, no alternative would contribute to the pollutants that caused it to be listed. No alternative would compromise any future restoration strategy that may be developed for this Water Quality Limited Stream.

Indian Creek

Cumulative or Watershed Scale Effects

Indian Creek has bull trout. No short-term or long-term effects to beneficial uses are expected at the watershed scale. Overall the watershed is appears to be not properly functioning due to the adverse effects of sediment which contribute to cobble embeddness and simplification of channel structure. As modeled and shown on the tables, there would no increase in sediment or peak flows at the watershed or tributary scale.

Proposed watershed improvement projects would be reduce sediment at both the tributary and watershed scale.

The cumulative effects analyses indicate there have been elevated sediment load and peak flows from past forest practices and roads. Continuing sediment inputs, primarily from roads, continue to inundate the stream inhibiting it's full recovery. All of the action alternatives would enhance recovery by reducing sediment from roads. Overall watershed condition would continue to improve as impacts from past forest management practices continue to heal.

Direct and Indirect Effects at the Tributary and Local Scales

Indian Creek has been subject to significant disturbance over a long period of time. The stream was identified as not properly functioning due to cobble embeddedness, the lack of channel structure, and the lack or large woody material.

Alternatives B, C and E propose about 200 acres of selective harvest about half of which is helicopter and about half is tractor yarded. Alternatives D and F propose about 870 acres of selective harvest -- about 600 acres would be tractor yarded, about 180 acres would be a combination of helicopter and tractor, and about 90 acres would be helicopter yarded. Alternative G proposes 870 acres of prescribed burning. For alternatives B, C and E, all ground disturbing activities are proposed on landtypes with a low sediment delivery potential and a low risk for mass wasting. Alternatives D and F propose about 30 acres on landtypes with moderate and a high sediment delivery potential and a moderate potential for mass failure.

As described in the typical effects section, selective harvest, when combined with the helicopter yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows. Best Management Practices including limiting the slopes that can be logged with a

tractor, use of water bars, limiting the number of skid trails, and seeding disturbed ground, would reduce sediment potential from the tractor harvest unit. The riparian buffers would be at least 300 feet. As described in the typical effects section, sediment generated in these harvest areas is not likely to enter the nearby streams. As modeled, this activity would not increase sediment or peak flows.

Aquatic restoration projects in this tributary area include reconstruction of parts of Forest Roads 1914, 1914120, and 1914205; and installation of gates to these roads to reduce use in the winter and spring. All of these are moderately used, native surface roads that are muddy in the spring. None are considered encroaching roads. Reconstruction of these roads would include surfacing and improvement of drainage -- both of which would reduce sediment in Indian Creek. The typical effects section describes the benefits to be derived from this activity. Sediment would increase temporarily during the reconstruction, but would decrease in the long-term. The effects of these restoration projects are not included in the sediment model.

For all alternatives, water quality, sediment yield, and peak flows would remain about the same. In the long-term, all alternatives would reduce sediment in Sandwich Creek. This reduction in sediment would enhance the recovery taking place in this tributary. These recovery trends would not be compromised in any alternative. Perhaps the recovery trend for sediment may be slowed for a short time (one or two years) in alternatives D and F.

Table III-265. Projected watershed response in the Indian Creek Watershed, by alternative.

WATERSHED NAME: Indian Creek Watershed							
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	111	111	111	111	111	111	111
Runoff modification (%)	9	10	10	10	9	10	9
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	0	0	0	0	0	0
Cumulative change in roads (miles)	0	0	0	0	0	0	0
Change in encroaching road (miles)	0	0	0	0	0	0	0

Bead Lake Basin

Cumulative Watershed Scale Effects

Water quality in Bead Lake is currently very good. The lake is considered oligotrophic or perhaps ultraoligotrophic -- nutrient levels are very low resulting in extremely clear water. The lake is used as a domestic water source for homes along the lakeshore. Bead Lake is very deep. Sediment from tributary streams does not appear to adversely impact the lake as a whole, however, nutrients entrained in sediments may be a significant source of nutrients in the lake. Therefore alternatives that reduce erosion and sedimentation may reduce the rate of nutrient accumulation in the lake.

Mass erosion has not been an issue in spite of steep slopes in the basin. Few roads have been constructed in the basin. There is a road system around the upper edge of the basin, and a Forest Service road system in the Lodge Creek area. There are a large number of roads on private land on the southwest side of the lake, but the slopes are very flat and it is unclear to what extent these roads impacts the lake. Except for a few stream crossings at risk, the road system is stable.

Direct and Indirect Effects at the Tributary and Local Scales

Alternatives B, C, and E propose about 350 acres of selective harvest using a helicopter yarding system. Alternative D proposes about 1,530 acres using a combination of helicopter (40%) and tractor (60%) yarding. Alternative F proposes about 670 acres using a combination of helicopter (30%) and tractor (70%). Alternative

G proposes to burn 670 acres. All ground disturbing activities are located on landtypes with low sediment delivery potential and low potential for mass failure.

As described in the typical effects section, selective harvest, when combined with the helicopter yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows. When logs are yarded with a helicopter, the helicopter picks up groups of logs that have been felled and bucked by fallers who walk through the unit. These groups of logs are called a 'turn'. Each turn may consist of one or two logs if they are large, or it may consist of several logs if they are small. There is some slight potential for duff to be disturbed when the log is lifted; sometimes some of the logs in the turn may be partially drag a short distance before they become airborne. The amount of disturbance for each turn is extremely small. Since each turn is located at a different location across the landscape -- the slight disturbance caused one log is unlikely to coincide with disturbances from other logs. Therefore, any slight amount of soil disturbed in one turn would be trapped by the duff and would not move off-site.

The tractor yarding proposed in alternatives D and F is located on the outwash terrace west of the lake. Best Management Practices including limiting the slopes that can be logged with a tractor, use of water bars, limiting the number of skid trails, and seeding disturbed ground, would reduce sediment potential from the tractor harvest unit. As described in the typical effects section, sediment generated in these harvest areas is not likely to enter the nearby streams. As modeled, this activity would not increase sediment or peak flows. There are no streams that reach from the proposed harvest areas to the lake. If any sediment were generated in these harvest areas, the chance of sediment delivery to the lake is nil.

Aquatic restoration projects in basin include reconstruction of parts of Forest Road 3215 (all action alternatives) and obliteration of Forest Road 3200016 and it's associated spur roads. In this basin, Forest Road 3215 is located near the ridge. Reconstruction of this road would reduce sediment, but the effect would be slight at both the tributary and basin scale. Forest Road 3200016 is a native surfaced road that receives light use, while all it's spur roads are closed. It is only 4.4 miles long, but it crosses Lodge Creek and it's tributaries many times. Alternatives D and G would reduce the risk of sediment and slope failure in Lodge Creek by this road and the removal of 1 inventoried crossing and 8 uninventoried crossings. In the short-term, obliteration and removal of so many crossings may increase sediment, but in the long-term water quality and sediment risk within Lodge Creek would improve over time as a result. The effects of these restoration projects are not included in the sediment model.

For all alternatives, water quality, sediment yield, and peak flows would remain about the same. In the long-term, alternatives D and G would reduce sediment from Lodge Creek. This reduction in sediment would enhance the recovery taking place in this tributary. These recovery trends would not be compromised in any alternative.

Table III-266. Projected watershed response in the Bead Lake watershed, by alternative.

WATERSHED NAME: Bead Lake Watershed							
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	42	42	42	42	42	42	42
Runoff modification (%)	10	10	10	10	10	10	10
Change in stream crossings (#)	0	0	0	-9	0	0	-9
Associated risk (tons/year)	0	0	0	-1.3	0	0	-1.3
Change in roads due to this project	0	0	0	-4.4	0	0	-4.4
Cumulative change in roads (miles)	0	0	0	-4.4	0	0	-4.4
Change in encroaching road (miles)	0	0	0	0	0	0	0

Marshall Lake

Cumulative Effects at the Basin Scale

No short-term or long-term effects to beneficial uses are expected at the watershed scale. The watershed is generally functioning adequately. As modeled and shown on the tables, there would be no increase in either sediment load or peak flows due to timber management or fuel treatments. Proposed watershed improvement projects would have a negligible effect on the watershed scale, but would have an effect at the tributary scale. The cumulative effects analyses indicate there have been elevated peak flows from fires in the early part of this century. The watershed is currently experiencing a recovery from these past activities. None of the alternatives would increase the recovery rate. All alternatives would enhance the recovery in the Burnt Creek tributary. Overall watershed condition would continue to improve to as impacts from past forest management practices continue to heal.

Direct and Indirect Effects at the Tributary and Localized Scales

Alternatives B, C, and E propose about 120 acres of selective and regeneration harvest using a helicopter and skyline yarding system. Alternative D proposes about 170 acres using a combination of helicopter and skyline yarding systems; and alternative F proposes about 60 acres using a combination of helicopter and skyline yarding systems. Alternative G proposes to burn 90 acres. All ground disturbing activities are located on landtypes with low sediment delivery potential and low potential for mass failure.

As described in the typical effects section, selective harvest, when combined with the helicopter yarding system and the wide riparian buffers, would have a very minimal impact on sediment yield, sediment delivery, or peak flows. The regeneration harvest is to be yarded with a helicopter. As discussed in the typical effects section, this unit would not increase sediment in the stream. Because of the limited amount of regeneration harvest, no change in peak flows would occur. As modeled, none of the alternatives would increase sediment load or peak flows.

Aquatic restoration projects in basin include reconstruction of parts of Forest Road 3215 (all action alternatives) and obliteration of Forest Roads 3215071, 3215075. In this basin, Forest Roads 3215, 3215071, and 3215075 are located near the ridge. Reconstruction and obliteration would reduce sediment, but the effect would be slight at both the tributary and basin scale. While reduction in road density may improve overall watershed condition, obliteration of these roads would not have an immediate impact on water quality. The effects of these restoration projects are not included in the sediment model.

For all alternatives, water quality, sediment yield, and peak flows would remain about the same. The reduction in sediment from road obliteration would be slight, but it would contribute to the recovery taking place in the basin. In the long-term, implementation of these projects would reduce the overall sediment load to Marshall Lake. The wetlands above the lake would not be affected by any alternative.

Table III-267. Projected watershed response in the Marshall Lake Watershed, by alternative.

WATERSHED NAME: Marshall Creek					TRIBUTARY: Marshall Lake basin		
Measure of Change	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**	**Alt. G**
Sediment load modification (%)	9	9	9	9	9	9	9
Runoff modification (%)	16	16	16	16	16	16	16
Change in stream crossings (#)	0	0	0	0	0	0	0
Associated risk (tons/year)	0	0	0	0	0	0	0
Change in roads due to this project	0	-1.8	-1.8	-1.8	-1.8	-1.2	-1.8
Cumulative change in roads (miles)	0	-1.8	-1.8	-1.8	-1.8	-1.2	-1.8
Change in encroaching road (miles)	0	0	0	0	0	0	0

Summary of Effects

Overall, none of the alternatives impact water quality, flow regimes, or channel conditions at a watershed scale. At the tributary scale, alternatives D, F and G would reduce sediment in Bead Lake (Lodge Creek tributary). All alternatives would obliterate an encroaching road in South Fork Skookum Creek, thereby reducing sediment and improving watershed condition. The table below displays a summary of the watershed restoration projects by alternative. In addition, all alternatives include an additional 4.5 miles of road obliteration to be financed using KV funding, if available. This additional road obliteration was considered "less certain" (see Appendix D), and therefore was not included in the effects of the alternatives described above.

Table III-268. Summary of watershed restoration elements, by alternative.

Measure of Change	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Change in stream crossings (#)	0	3	3	13	3	4	13
Associated risk (tons/year)	0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Change in roads due to this project	0	-3.9	-3.9	-8.8	-3.9	-3.7	-8.8
Cumulative change in roads (miles)	1.6	-2.3	-2.3	-7.2	-2.3	-2.1	-7.2
Change in encroaching road (miles)	0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Effects of Opportunities

Timber stand improvement projects (pre-commercial thinning and pruning) would have no effect on sediment, stream flow, or channel conditions. The effects of the **Water restoration projects** (4.5 miles of additional road obliteration) are similar to discussed previously. This additional road obliteration is located in the Marshall Creek basin. In the short-term, road obliteration would generally increase sediment as culverts are removed. In the long-term, sediment is decreased..

Consistency with the Forest Plan and Other Applicable Regulatory Direction

All alternatives are consistent with the Clean Water Act. All alternatives use Best Management Practices (see Chapter II) to reduce non-point pollution. The Best Management Practices were developed by soil scientist in an interdisciplinary setting. The Washington State Best Management Practices, as set forth in the Forest Practices Handbook, were reviewed, and the project's Best Management Practices clearly meet or exceed these practices. None of the alternatives is anticipated to significantly reduce water quality or watershed condition. Activities are proposed in a watershed that is currently listed on the state's 303(d) list as a water quality impaired stream, Skookum Creek. The creek is listed for fecal coliform. The Forest Service has no livestock grazing in this watershed, and subsequent studies have found the source to be on private lands. None of the alternatives would have any impact of the pollutant for which the stream is listed.

All alternatives meet the Forest Plan through the use of Best Management Practices. All alternatives meet the Settlement Agreement with the Bead Lake Clean Water Association (1989) by the use of the WATSED model to analyze soil disturbance and sedimentation.

All alternatives meet the standards listed in the Inland Native Fish Strategy (INFS). This analysis adopted the standard widths for Riparian Habitat Conservation Areas (RHCA's) as described in the INFS EA. The project promotes watershed restoration through the reduction of sediment and the obliteration of roads.

The Riparian Habitat Conservation Areas (RHCA's) include all wetlands and floodplains in the planning area. No harvest or burning is proposed in these RHCA's. None of the alternatives would cause a loss of wetlands. None of the alternatives would adversely impact wetlands.

SOIL PRODUCTIVITY

CHANGES BETWEEN THE DRAFT AND FINAL EIS

Soil productivity was moved as a subsection under hydrology to its own section. Additional analysis was done to ensure that Forest and Regional standards would be met. In response to public comment, additional analysis for potentially potassium-limited soils was added.

REGULATORY FRAMEWORK

The regulatory framework for maintain soil productivity is provided by the Multiple-use Sustained Yield Act of 1960 which directs the Forest Service to achieve and maintain outputs of various renewable resources in perpetuity without permanent impairment of the land's productivity; and the National Forest Management Act of 1976 (NFMA) which requires the Forest Service to safeguard the land's productivity. The implementing regulations for Forest Planning that followed NFMA requires the Forest Service to measure effects of prescriptions, including "significant changes in land productivity" (Code of Federal Regulations 36, CFR Part 200, Section 1, 1987). To comply with NFMA, the Chief of the Forest Service has charged each Forest Service Region with development of soil quality standards for detecting soil disturbances indicating a loss in long-term productive potential. For the Region 6 and the Colville National Forest, these soil quality standards are located in the Forest Service Manual at 2520, R6 Supplement 2500-98-1. These standards supplement the standards in the Colville Forest Plan.

AFFECTED ENVIRONMENT

Soil productivity is the output of a specified plant or group of plants under a defined set of management practices, or total plant mass produced annually per unit area.

The most productive part of the soil occurs near the surface at the contact between the forest litter and the mineral soil. Here the litter has been highly decomposed into dark colored amorphous material. This layer is frequently only a few inches thick but it's presence is much more important than it's thickness would indicate. This organic matter rich layer contains most of the soil nitrogen, potassium and mycorrhizae which must be present for a site to be productive.

Below this organic horizon is volcanic ash which occurs as the surface layer of the mineral soil. In eastern Washington, the ash layer is typically 16 inches thick, ranging between 7 and 24 inches on most sites. The top part of the ash is usually enriched in organic matter which also contributes nitrogen, potassium and mycorrhizae to this part of the soil. The lower part of the volcanic ash has less organic matter and is not as fertile as the upper part. The ash has a high water holding capacity and nutrient holding capacity both which are important for soil productivity.

Below the volcanic ash, the subsoils and substratum tend to be coarse textured in the granitic and glacial outwash soils, and medium textured in the metasedimentary soils. These subsoil and substratum materials are very weakly weathered. They tend to have a high component of rock fragments, although, this can be quite variable, particularly in the alluvial bottoms and outwash materials. The lacustrine or lakebed soils have subsoil and substratum materials that are fine textured, with few rock fragments. A more detailed description of the soils can be found in the Pend Oreille County Soil Survey Report (USDA SCS, 1992).

Some soils in the Newport planning area may be potassium (K) limited. Unlike many other soil nutrients, potassium is derived almost entirely from the underlying rock formation. Most of the site's potassium is taken up by and stored in woody plants. The majority of recyclable potassium is tied up in the tree branches

and foliage, but 14% of the potassium in a tree is held in the bole. The potassium returns to the soil when the woody vegetation dies. Some very preliminary research being done by the Intermountain Forest Tree Nutrition Cooperative is showing a possible link between potassium deficiency and the lack of tree resistance to root rot diseases (Garrison and Moore, 1998). On the IPNF, a preliminary review found that the highest concentration of root rot pockets tend to occur on the Prichard and St. Regis geologic formations. The IFTNC has developed a method of using geologic information to predict soils deficient in K (Garrison, 1996). Based on this research and other information, soils on the St. Regis and Prichard geologic formations are likely to be low in K (Harrison and Campbell, 1963).

Most of the productivity of all project area soils is found near the soil surface. This is also the part of the soil that is easiest to disturb by management activities. The soils of this project area generally rate low to moderate in productivity potential.

ENVIRONMENTAL CONSEQUENCES

Methodology

Direct, indirect and cumulative impacts related to the alternatives of this project on soil productivity were analyzed at the site scale. At the site scale, cumulative effects occur when the effects of past activities are combined with proposed and reasonably foreseeable activities.

Three elements of soil productivity were analyzed.

1. Whether the Alternatives Meet the Forest and Regional Standards for Detrimental Soil Conditions

To meet the Forest and Regional Standards for soil productivity, 80% of an activity area must be in an acceptable soil quality condition. This standard is based on the lowest magnitude of adverse change detectable, given current monitoring technology (Powers et al. 1990). Detrimental conditions include compaction, detrimental puddling, displacement, burned soils, erosion, and mass wasting (see FSM 2520 R6 supplement 2500-98-1).

Using a combination of aerial photo interpretation, and data from the district's activity and road databases, the existing condition for each unit was estimated. Using factors developed by the Idaho Panhandle National Forest soil monitoring data, the extent of detrimental condition was estimated. Units that may exceed standards, or may be close to exceeding the standard were identified. The acres proposed for harvest are shown on table III-266. The pre-sale forester would be responsible to verify actual unit conditions and insure that the unit layout would meet the standards. The likely mitigation for soils that fail to meet soil quality standards for compaction is deep subsoiling with a winged subsoiler on all non-dedicated landings and skid trails to decrease soil compaction. The Regional Standard says that, if a site currently exceeds the standard, it can be treated if the treatment results in a net reduction in detrimental soil conditions. The use of existing skid trails and subsoiling would result in a net reduction, therefore meeting the soil quality standards.

Using the methodology described above, most units probably do not currently exceed the soil quality standards. Mitigation would keep more than 80% of the activity area in an acceptable soil quality condition. By requiring skid trails to be about 130 feet apart, detrimental compaction would be limited to less than 15% of the harvest area. Best Management Practices would prevent intense fires that might harm soil productivity.

2. Impacts to Sites that are Potentially Potassium Limited

Soils developed on the Prichard and St. Regis geologic formations are potentially potassium limited. A map of proposed project units was overlaid on a map of geologic formations to determine which units occurred on

the Prichard and St. Regis geologic formations. Whole tree yarding, removal of tree tops and grapple piling leads to the direct loss of potassium (Morris and Miller, 1994). In all alternatives mitigation was developed to minimize the loss of potassium from the site. These mitigation measures include no whole-tree yarding, no removal of tops, no grapple piling, and leaving fine residues (slash) on the ground for 1 year prior to treatment to allow K to leach into the soil (see Morris and Miller, 1994). These practices are recommended by the IFTNC (Garrison, personal communications) and represent the state-of-the-art recommendation for this concern.

3. Changes to the Productive Landbase

Road construction would reduce the productive landbase; however, no road construction is proposed in the Newport planning area. Road obliteration would begin a restoration process that would eventually restore productivity to these lands. Miles of road obliteration are displayed on the following table.

Direct and Indirect Effects

Table III-269. Potential effects on soil productivity, Newport planning area.

Parameter	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Regional Standards							
Total acres harvested	0	1,521	1,521	4,762	1,521	3,384	0
Acres to be tractor yarded[1]	0	223	223	1,622	223	1,607	0
Acres to be harvested that are estimated to currently not meet soil quality standards	0	32	32	123	32	91	0
Potential Potassium Limited Soils							
Acres to be harvested/fuel treatment on Prichard and St. Regis rock types	0	776	776	2,425	776	1,190	0
Acres to be burned only on Prichard and St. Regis rock types (no harvest)	0	0	0	0	0	0	980
Changes to the Productive Landbase							
Miles of road obliteration	0	-8.8	-8.8	-13.7	-8.8	-10.9	-13.7

Effects of Alternative A

A direct affect of beetle infestation is acceleration of tree mortality, increasing down organic matter and fuel loadings. In moist habitat sites, which make up approximately 35% of this project area, this increase in organic matter is a benefit to soil productivity. This response would be much less or could be a negative in dry habitat types which make up approximately 65% of this project area. Increased fuel loadings would increase the risk of soil damage (loss of organics, loss of nutrients, reduction of infiltration; this would substantially reduce the productivity of the site) in the event of high severity fires.

The areas that are estimated to currently not meet soil quality standards for detrimentally disturbed soils would remain in their current condition.

Increased fuel loadings on potassium limited sites would increase the risk of potassium loss through fly ash removal in the event of high severity fires.

[1] *This is an estimate assuming that 50% of acres showing a combination logging systems (tractor/skyline, heli/tractor) will be tractor yarded.*

Effects Common to Alternatives B, C, D, E, and F

All action alternatives would produce an increase in detrimental soil disturbance, such as compaction and displacement, particularly on the tractor harvest units. Minor levels of soil disturbance would occur on skyline and helicopter yarded units, and the likelihood that these units would fail to meet soil quality standards is slight. All action alternatives are expected to meet the Regional and Forest's soil quality standards through the application of mitigation in Chapter II. Skid trail spacing of 130 feet effectively limits the number of skid trails, thereby ensuring that less than 15% of the harvest area.

On some sites 45% of the potassium on the site is held in trees; the remainder is held in subordinate vegetation, the forest floor and the soil. Within the trees, about 85% of the potassium is held in the branches, twigs and foliage (Garrison and Moore, 1998). In most natural circumstances the potassium returns to the soil when the tree dies. If potassium is removed from the site, the loss is long-term. Harvesting on all sites would remove the tree bole -- which contains about 15% of the potassium held by the tree. A positive affect occurs when the foliage and branches of harvested Douglas-fir trees are allowed to recycle on site, thereby, releasing stored nutrients, such as potassium and nitrogen back to the soil. Douglas-fir consumes and stores more potassium than most other trees. The release and availability of this stored potassium would benefit larch and western white pine, which require less potassium for growth and maintenance (Garrison and Moore, 1998). These more potassium efficient trees would be planted in all regeneration harvest units and favored within the improvement harvest units.

All units in these alternatives would receive underburning or "lop and scatter" fuel treatments. Both of these treatments would retain the maximum practical potassium on the site after logging. Grapple piling is not proposed.

All alternatives will follow the coarse woody material guidelines in Graham, et al., 1994, which are included as mitigation in Chapter II. Up to 40 tons per acre of coarse woody material would benefit long-term soil productivity without creating an unacceptable fire hazard. The optimum level of fine organic matter is 21% to 30% and this equates to 1 to 2 inches of surface litter and humus. These levels of organic material positively relate to ectomycorrhizae fungi with form a strong relationship with many forest trees and other vegetation. Ectomycorrhizae is a good indicator of a healthy forest soil. In moist western hemlock and cedar habitat types, high levels of ectomycorrhizae exist then organic matter levels exceed 30%. Soil survey data indicates that most forest sites have adequate organic material to support strong ectomycorrhizae populations. Therefore the proposed mitigation would be sufficient to protect this aspect of soil productivity.

Effects of Alternative B, C and E

Alternatives B, C, and E would harvest and treat fuel on 1,521 acres. Helicopter or skyline yarding systems are proposed on 1,235 acres; helicopter with some tractor is proposed on 126 acres, and 160 are proposed to be tractor logged. These alternatives include 35 acres of harvest where the existing soil condition is estimated to not meet the soil quality standards, and 36 acres where the existing soil condition may be close to not meeting the soil quality standards. The units that are estimated to currently exceed the soil quality standards or identifies as possibly not meeting the soils quality standards are proposed for skyline and helicopter yarding. These harvest methods would cause little to no increase in detrimental soil disturbance.

Effects of Alternative D

Alternative D would harvest and treat fuel the maximum number of acres. Helicopter or skyline yarding systems is proposed on 2,788 acres, helicopter with some tractor is proposed on 675 acres, skyline with some tractor is proposed on 30 acres, and 1,269 acres are proposed to be tractor logged. These alternatives include 126 acres of harvest where the existing soil condition is estimated to exceed the soil quality standards, and 36 acres where the existing soil condition may be close to not meeting the soil quality standards. The units that are estimated to currently not meet the soil quality standards or identifies as possibly not meeting the soils

quality standards are proposed for skyline and helicopter yarding. These harvest methods would cause little to no increase in detrimental soil disturbance.

Effects of Alternative F

Alternative F would have harvesting and fuel treatments on 3,384 acres. Helicopter or skyline yarding systems is proposed on 1,439 acres; helicopter with some tractor is proposed on 675 acres; and 1,269 acres are proposed to be tractor logged. These alternatives include 91 acres of harvest where the existing soil condition is estimated to not meet the soil quality standards, and 36 acres where the existing soil condition may be close to not meeting the soil quality standards. The units that are estimated to currently not meet the soil quality standards or identifies as possibly not meeting the soils quality standards are proposed for skyline and helicopter yarding. These harvest methods would cause little to no increase in detrimental soil disturbance.

Effects of Alternative G

Alternative G proposes broadcast burns only. The mitigation measures in chapter 2 would apply to all proposed burn units. Controlled burn activities would have a positive effect by releasing stored potassium for plant uptake.

Cumulative Effects

Alternative A: Cumulative impacts resulting from recent Douglas-fir beetle activity include an increased risk of high-severity, soil organic matter consuming wildfire due to predicted high fuel loading. Such a fire, if it were to occur, would be predicted to have a moderate to high effect on soil nutrient and soil structure loss. This could result in reduced tree seedling establishment, tree growth and insect and disease resistance.

Alternatives B, C and E: Roading, ground-based harvesting , hot burning and cable corridors which operate outside of existing roads, cable corridors, or easily identifiable skid trails would increase the percentage of detrimental soil compaction, burning or displacement on proposed harvest sites where previous harvest activities have occurred. These cumulative impacts particularly on potassium limited sites would be predicted to produce slower growing trees, somewhat less stand volume and probably less resistance to root rot. Where more potassium efficient trees are planted or favored some of the above impacts would be predicted to be somewhat less. These alternatives would affect the least acreage and has less tractor units, which would have a smaller impact on soil productivity.

Alternative D: Roading, ground-based harvesting , hot burning and cable corridors which operate outside of existing roads, cable corridors, or easily identifiable skid trails would increase the percentage of detrimental soil compaction, burning or displacement on proposed harvest sites where previous harvest activities have occurred. These cumulative impacts particularly on potassium limited sites would be predicted to produce slower growing trees, somewhat less stand volume and probably less resistance to root rot. Where more potassium efficient trees are planted or favored some of the above impacts would be predicted to be somewhat less. This alternative would affect the most acreage and have the largest impact on soil productivity. All action alternatives would meet Forest Plan soil productivity guidelines which are designed to keep cumulative impacts low.

Alternative F: Roading, ground-based harvesting , hot burning and cable corridors which operate outside of existing roads, cable corridors, or easily identifiable skid trails would increase the percentage of detrimental soil compaction, burning or displacement on proposed harvest sites where previous harvest activities have occurred. These cumulative impacts particularly on potassium limited sites would be predicted to produce slower growing trees, somewhat less stand volume and probably less resistance to root rot. Where more potassium efficient trees are planted or favored some of the above impacts would be predicted to be somewhat less. This alternative would affect a little less acreage than Alternative D and has one less tractor unit, which would produce a little less impact on soil productivity than Alternative D.

Alternative G: Alternative G would have a very small loss of potassium off site in fly ash during burning. Only low intensity broadcast burning would occur in this alternative, so no further cumulative effects are anticipated.

Effects of Opportunities

Timber stand improvement projects (pre-commercial thinning and pruning) would have no impact on soil productivity. **Watershed restoration** projects (road obliteration) would improve soil productivity by allowing these lands to return to the productive landbase.

Consistency with the Forest Plan

As described earlier, all alternatives meet the Forest Plan standards for detrimental soil conditions through the use of mitigation measures.

FISHERIES

REGULATORY FRAMEWORK

The National Forest Management Act (NFMA) (1976) requires that the Forest Service manage for a diversity of fish habitat to support viable fish populations 36 CFR 219.19). Regulations further state that the effects on these species and the reason for their choice as management indicator species be documented 36 CFR 219.19(a)(1)). The 1969 National Environmental Policy Act (NEPA) requires analysis of projects to insure the anticipated effects upon all resources within the project area are considered prior to project implementation (40 CFR 1502.16). Section 7 of the 1973 Endangered Species Act (ESA) includes direction that Federal agencies, in consultation with the United States Fish and Wildlife Service, will not authorize, fund, or conduct actions that are likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat. Executive Order 12962 (June 7, 1995) states objectives "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by: (h) evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order."

The Forest Plan for the Colville National Forest provides management goals and objectives for the protection of the fisheries resources. The Inland Native Fish Strategy (INFS) amended the Colville Forest Plan in August 1995 and contains additional standards and guidelines to protect the aquatic environment.

Proposed activities in the Douglas-fir Beetle Project EIS were analyzed with respect to these regulatory requirements in the Fisheries sections. Additional regulatory requirements related to fisheries resources (e.g. Clean Water Act and Washington Water Quality Standards) are addressed in the Water Resources sections.

AFFECTED ENVIRONMENT

The cumulative effects areas are six groups of watersheds. These groups are Pend Oreille Face, CCA (Browns), Skookum, Indian Creek, Bead Lake, and Marshall (see the watershed section for descriptions of these areas). These analysis areas are used to describe the fish resources and the effects.

Table III-270. Sixth-field code watersheds and associated HUC numbers.

Name	HUC Number	Analysis Acres*
Pend Oreille Face	1701021600	4,288
CCA (Browns)	1701021618	4,160
Skookum	1701021618	20,480
Indian Creek	1701021619	4,096
Bead Lake (Lodge)	1701021620	2,240
Marshall (Burnt)	1701021621	896

** Area of analysis. Does not include entire HUC area. Some of these analysis areas are different than used in the watershed analysis portion of this chapter.*

Fish Resources

These cumulative effects watersheds areas contain approximately 150 miles of fish-bearing streams. Fish species that inhabit streams in this area include native populations of westslope cutthroat (*Oncorhynchus clarki*), bull trout (*Salvelinus confluentus*), mountain whitefish (*Prosopium williamsoni*), northern pike minnow (*Ptychocheilus oregonensis*) (formerly known as squawfish), large-scale sucker (*Catostomus macrocheilus*), sculpin (*Cottus* spp.), and possibly longnose dace (*Rhinichthys cataractae*) and redside shiner (*Richardsonius*

balteatus). Introduced fish species include populations of rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). Fish that are the product of hybridization between native cutthroat trout and exotic rainbow trout and between native bull trout and exotic brook trout may be present. The distribution of some of these fish within streams in the cumulative effects areas can be found in the following table.

The current conditions of the fisheries resources in the cumulative effects areas were established by interpreting information from stream inventories, field reviews, historical records, aerial photographs, analysis of watershed conditions, published scientific literature, discussions with Fisheries Biologists from the United States Fish and Wildlife Service (USFWS), and a comprehensive knowledge of the fisheries resources in the Pend Oreille Basin near Newport.

Table III-271. Summary of fish species distribution within selected streams, Newport planning area.

Stream Name	HUC	Access	WCT	BT	RT	BkT	MW or PW	Scp
Pend Oreille Face	**170102160000**	No streams in this watershed are fish-bearing						
CCA	**170102161717A**							
Browns	170102161717B	Y	Y	LH	Y	Y	LY	LY
Upper Browns	170102161717B	Y	Y	N	N	Y	LY	LY
Skookum	**170102161818A**							
Skookum	170102161818A	N*	H	LH	Y	Y	Y	LY
Skookum NF	170102161818B	Y	H	H	Y	Y	Y	LY
Skookum Little	170102161818B	Y	H	H	Y	Y	LN	LY
Split	170102161818B	Y	LN	LN	Y	Y	LN	LY
Tribs to North Skookum Lake	170102161818B	N	H	H	Y	Y	LN	LY
Cooks	170102161818C	N*	H	H	Y	Y	LN	LY
Skookum SF	170102161818C	N*	H	H	Y	Y	LN	LY
Indian	**170102161919**							
Indian	170102161919	Y	Y	LY	LY	Y	LY/H	LY
Bead Lake	**170102162020**							
Lodge	170102162020	Y	N	N	N	Y	LH	LY
Marshall	**170102162121**							
Burnt	170102162121	Y	N	N	N	N	LH	LY

Codes used in the preceding table

Species codes: WCT=westslope cutthroat trout, BT=bull trout, RT=rainbow trout, BkT=brook trout, MW=mountain whitefish, PW=Pygmy whitefish and Scp=Sculpin.

Access codes: Y=access present, no known migration barriers; N=human-caused migration barrier within the stream; N*=natural migration barrier within stream.

Codes for species present: Y= surveyed and present, LY=unsurveyed but likely to be present, N=surveyed and not present, LN=unsurveyed but unlikely to be present, LHlikely historic, now not present, H=historic, now not present.

Due to the large number of fish species within the cumulative effects areas, analysis of direct, indirect, and cumulative effects to fish will use the concept of management indicator species (MIS). Under this concept, larger groups of organisms or communities are believed to be adequately represented by a subset of the group (Colville National Forest Plan 1988). Westslope cutthroat trout and bull trout are native to some

streams in the Newport planning area (data on file). Westslope cutthroat trout are known to currently be utilizing streams within the planning area for spawning, rearing, and over-wintering. Although bull trout were likely historically present in the project area they have not been documented in any of the drainages except Indian Creek. Nonetheless, westslope cutthroat trout and bull trout have been selected as appropriate MIS for the fisheries analysis of this vegetative and watershed restoration opportunities related to Douglas-fir beetle tree kills. Although both of these fish do not exist in all streams, in general one of the two is found in all large streams. In addition these species are likely sensitive indicators for all the cold water biota within the stream segment (Meehan 1991). Region 6 has two sensitive species, pygmy whitefish and redband trout, that have the potential to be found within the project area. The life histories of these species will be described below but since they are cold water species like the MIS, the effects on these species will be included in the description of effects to the MIS.

Westslope Cutthroat Trout: Westslope cutthroat trout are listed as "sensitive" by Region 6 of the USDA Forest Service. In addition, the U.S. Fish and Wildlife Service (USFWS) lists westslope cutthroat trout as a "Species of Concern" with respect to section 7(c) of the 1973 Endangered Species Act (ESA) (1/12/99 letter; also this species was recently petitioned for listing under the Endangered Species Act). Westslope cutthroat trout are native to three of the cumulative effects watersheds which are contained in this project area (references and data on file at district office). Their preferred habitat is cold, clear streams that possess rocky, silt-free riffles for spawning and slow, deep pools for feeding, resting, and over-wintering (Reel 1989). Pools are a particularly important habitat component as cutthroat trout occupy pool habitat more than 70% of the time (Mesa 1991). Other key features of cutthroat habitat are large woody debris (LWD) for persistent cover and habitat diversity as well as small headwater streams for spawning and early rearing.

Resident life history strategies of westslope cutthroat trout are currently present within watershed within the project area (data on file at district office). Resident populations remain in river tributaries throughout their life. Migratory populations (fluvial and adfluvial fish) use river tributaries for early rearing and spring spawning as adults but typically out-migrate to river (fluvial) or lake (adfluvial) habitat as they mature. In the fall, fish that have not previously returned to river and lake areas migrate to deeper water where they congregate and over-winter (Bjornn 1975). Streams within the project area may have historically been utilized by westslope cutthroat trout representing all life history strategies during various phases of their life cycle; however, currently mostly resident fish exist and are generally confined to headwater streams.

Of the streams listed on Table III-271, Upper Browns and Indian Creek are likely most important to westslope cutthroat trout persistence within the analysis area. Upper Browns has connectivity to Browns Lake and is an important source of refugia for fish in Browns Lake. This connectivity is crucial for any adfluvial cutthroat trout that may be in the system. Indian Creek has excellent habitat in the headwaters, although connectivity with lower reaches may be lacking.

Bull Trout: Bull trout may be native to the all the cumulative watersheds within the project area. Bull trout were listed (June 10, 1998) as a "threatened" species under the ESA. Currently bull trout are known to inhabit Indian Creek. Bull trout appear to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Habitat characteristics including water temperature, stream size, substrate composition, cover and hydraulic complexity have been associated with the distribution and abundance (Dambacher and others, in press; Jakober 1995; Rieman and McIntyre 1993).

Stream temperature and substrate composition are important characteristics of suitable bull trout habitats. Bull trout have repeatedly been associated with the coldest stream reaches within basins. The lower limits of many strong bull trout distributions mapped by Lee et al. (1997) correspond to a mean annual air temperature of about 4 degrees Centigrade (ranging from 3 to 6 degrees Centigrade) and should equate to ground water temperatures of about 5 to 10 degrees Centigrade (Meisner 1990). Temperature may be strongly influenced by land management (Henjum et al. 1994).

Of the streams listed within Table III-271, Indian Creek is likely the most important to species persistence for bull trout within the analysis areas. Indian Creek has excellent habitat in the headwaters, although connectivity with lower reaches may be lacking.

Pygmy Whitefish: Pygmy whitefish occur in the Columbia River system in Montana, Idaho, Western Washington, and British Columbia. The meager evidence available on spawning indicates its eggs are deposited in shallows of streams and lakes in December and January. This species is generally found at depths greater than 20 feet and in large streams (Wydoski and Whitney, 1979). Because this species is a cold water species, the effects to pygmy whitefish will be the same as those described to the MIS.

Redband Trout: Behnke (1992) defines Columbia River redband trout to be found above barrier falls of the Kootenay, Pend Oreille, Spokane, and Snake River. Recent genetic work has found that this subspecies has a limited distribution within this region. Benke (1992), however suggest that redband trout and westslope cutthroat are rarely found in sympatry. Habitats used by this species, however, are similar to those of westslope cutthroat and they are similarly affect by land management. As a result of these similarities the effect to redband trout will be the same as those described to the MIS.

Environmental Conditions Affecting the Fish Resource

Environmental conditions in the cumulative effects area have been influenced by natural events and processes as well as human activities. Effects of natural disturbances such as volcanic eruptions (e.g. Mt. St. Helens, Mt. Mazama), historic fires, landslides, and flooding have interacted with other land evolving processes (e.g. geologic up-lift and stream channel down-cutting) to form the basic character of watersheds and the dependent stream resources. Due to variability in the location, frequency, intensity, and ultimately, the effects of natural processes on the physical environment, dynamic landscapes with diverse conditions are formed at various spatial scales. Biological communities including native fish populations led to development of functional ecosystems that are inherently resilient to effects from natural disturbance regimes representing pulse-type disturbance (Reeves *et al.* 1995). Pulse disturbances influence the natural range of environmental conditions that are expected for ecosystems functioning at broad geographic scales but typically allow systems to begin recovering to pre-disturbance conditions soon after the disturbance.

Natural disturbance regimes and their associated properties (*e.g.* sedimentation rates and other influences on aquatic habitat) have been altered in the cumulative effects area by human activity. Land use activities that have modified natural disturbance characteristics include roads, flumes/chutes, settlements/towns, mining, stream modifications (constriction, channelization, diversion, dams, culverts, and cleaning - removal of woody debris), logging, and fire suppression. Many of these human influences are considered press-type disturbance that continue to affect the condition and trend for fisheries resources long after the initial disturbance. Press disturbance differs from pulse disturbance in several aspects but generally press disturbance is persistent in ecosystems and impairs the ability for ecosystems to recover to pre-disturbance conditions (Reeves *et al.* 1995). Within the cumulative effects area, the recovery process from pulse disturbance has been hindered by the presence of various press disturbances. The following discussion relates these findings to the existing condition of fish habitat.

In general, the landscapes in this area can be broadly described by four different disturbance regimes. The first of these are areas that were not burned by large fires in the first part of this century and not significantly altered by anthropogenic activities. The second of these areas not burned by large fires in the first part of this century but have been managed by humans since -- this describes most of the area not burned near the turn of the century. The third of these areas were burned by large fires in the first part of this century and have not been entered. And the final of these areas were burned by large fires in the first part of this century and are now currently managed. The disturbance history has played a large role in determining stream habitat conditions.

Unburned Watersheds Without Management Activities (Unharvested)
There are no watersheds within the six cumulative effect analysis areas that meet this criteria. Conditions of these watersheds include complex stream conditions with complex fish habitat. The probability of persistence of resident fish within these basins is high. The stream conditions within these basins serve as reference conditions for other unburned watersheds.

Unburned and Harvested Watersheds

Other watersheds not burned since the early 1900s in the cumulative effects area have experienced more recent disturbances associated with land management. Various intensities of road activity (*e.g.* construction, reconstruction, and maintenance), timber harvest, mining, and/or recreational facilities have influenced the rate of fish habitat recovery from historical disturbances in several streams. The existing transportation system in the cumulative effects area is an extension of historic road locations which paralleled stream courses from the valley bottoms to the mountain ridges in many cases. A large number of the fish bearing streams have more than 25% riparian habitat altered by either roads or harvest. Three of the six watersheds have not burned but have been harvested (please refer to the table below). Numbers are approximates.

Table III-272. Unburned and harvested watersheds, Newport planning area.

Stream Name	HUC	Area of Riparian Roads	Area of Riparian Harvest
CCA	**170102161717A**		
Browns	170102161717B	>25%	<10%
Upper Browns	170102161717B	>25%	<10%
Skookum	**170102161818**		
Skookum	170102161818	>25%	10-25%
Skookum NF	170102161818B	>25%	10-25%
Skookum Little	170102161818B	>25%	10-25%
Split	170102161818B	10-25%	10-25%
Tribs to North Skookum Lake	170102161818B	10-25%	<10%
Cooks	170102161818C	>25%	10-25%
Skookum SF	170102161818C	>25%	<10%
Bead Lake	**170102162020**		
Lodge Creek	170102162020	10-25%	10-25%

Burned and Unharvested Watersheds
Early 20th century fires burned over these parts of the cumulative effects area and altered the condition and trend for many streams. Areas that reburned within a relatively short time span have been slower to recover from these fires. Most stream channels in areas that have not been entered for harvest have adjusted to altered hydrologic conditions resulting from historic fires and these channels are generally stable. Riparian areas affected in this way typically offer less protection for stream temperatures (*i.e.* stream shade) and have a lower recruitment potential for large woody debris (LWD). A lack of LWD recruitment can inhibit the development and maintenance of diverse habitat conditions including quality pool habitat and complex cover. Though the condition of fish habitat (*e.g.* maximum stream temperatures, aquatic habitat diversity, and cover complexity) in watersheds that have most recently been influenced primarily by wildfires without harvest disturbances are at various stages of recovery, the trends are favorable for sustaining salmonid populations. There are no watersheds in the Newport planning area that were burned but not harvested.

Burned and Harvested Watersheds
Streams in watersheds that were logged following recent historic fires have experienced similar but more prolonged residual effects than those streams in watersheds where salvage logging did not occur. Logging and associated activities intensified the effects of fires because unburned trees that would otherwise have been available to facilitate fish habitat maintenance and recovery were removed by various means (*e.g.* roads,

railroads, flumes, and splash dams) which often resulted in additional disturbance to stream channels and associated riparian areas. Increased impacts to streams and riparian areas has extended the recovery period necessary to develop quality fish habitat. As a result, fish habitat conditions in streams that have most recently been influenced primarily by wildfires and the ensuing salvage logging activities are generally earlier in the recovery process than streams in watersheds that were not salvage logged. A large number of the fish bearing streams have more than 25% riparian habitat altered by either roads or harvest. Watersheds that have been burned and harvested are listed in the following table. Numbers are approximates.

Table III-273. Burned and harvested watersheds, Newport planning area.

Stream Name	HUC	Area of Riparian Roads	Area of Riparian Harvest
Indian	**170102161919**		
Indian Creek	170102161919	10-25%	10-25%
Marshall	**170102162121**		
Burnt Creek	170102162121	<10%	<10%
Pend Oreille Face	**170102160000**		

General Effects of Land Management Activities

Newer roads and some historic roads within the cumulative effects area have been constructed in more stable locations higher on the hillslopes and are of less concern for fisheries resources (see hydrologic assessment). However, roads on hillslope locations can contribute to impaired fish habitat conditions. These roads can elevate stream sedimentation by increasing surface erosion potential and mass erosion potential.
Recent (past five years) timber harvest units, mining, and recreational facilities have generally had a less dramatic effect on fisheries resources than historical fires, historical salvage operations, and the existing transportation system (Furniss et al. 1991). Recent timber harvests and associated roads have contributed to cumulative effects that are affecting recovery of fish habitat conditions in these streams.

The quality of fish habitat conditions in the cumulative effects area has generally been compromised but is adequate to support viable populations of some coldwater biota. Diverse conditions of the habitat components (stream temperatures, aquatic habitat diversity, cover complexity, and channel stability) that are primarily responsible for regulating populations of native salmonids in the cumulative effects area have enabled these populations to persist albeit at suppressed levels. Analysis of existing conditions indicates that many streams in the cumulative effects area continue to recover from the residual effects from historic pulse-type (fires, volcanos) disturbance acting in isolation or in combination with effects from on-going press-type (timber harvest, road building) disturbances (Chamberlin et al. 1991).

In addition to public land management activities within these six cumulative watershed effects areas there is substantial private property. This mixed ownership has resulted in the loss of resiliency within this basins. In addition, private ownership and their reliance on roads (i.e., these road can not be removed) within the basin reduces flexibility for the restoration of the MIS.

One possible effect of management on MIS fish species not explored within this EIS is changes in peak flow. Inasmuch as large-scale fires in Northern Idaho and Eastern Washington resulted in the historic condition of this basin often having more openings than the current condition, it is unlikely any changes in peakflows resulting from these management activities would have a direct, indirect, or cumulative effects outside the conditions in which these fish evolved. In addition, Jones and Grant (1996) state the natural range of variability of peak flow varies by an order of magnitude whereas the increase associated with human activities is no more than 50%. This, once again, suggests that fish have evolved to live through variable flows. The condition fish have not evolved with, however, is habitat that has been greatly simplified as the result of habitat modification; this will be covered in environmental consequences.

Because most of the planning area is in watersheds that have been negatively affected by human management the goal for future management is to restore processes that form stream habitat. The easiest way to achieve this goal is to reduce the effects of roads while maintaining or improving riparian habitat conditions. While the minimum requirement for this project is to maintain fish habitat (INFS 1995) the fisheries resource would be best served by improving stream habitat conditions.

ENVIRONMENTAL CONSEQUENCES

Methodology

Habitat Components- Direct and Indirect effects
Existing conditions were established for primary habitat components believed to be influencing the production potential of the MIS fish species within the nine cumulative effects areas. Changes to these habitat components by the action alternatives are addressed by measuring changes in physical structures that affect the habitat components important to fish and are affected by management actions. Habitat components of interest include stream temperature, aquatic habitat diversity, cover complexity, and channel stability.

Stream temperature is one indicator of aquatic habitat conditions for this project area (Hicks et al. 1991). Stream temperature information collected during stream surveys is evaluated in relation to Idaho State Water Quality Standards for designated beneficial uses. The direct removal of riparian vegetation through road construction and timber harvest can indirectly change stream temperature by increasing sunlight to the water.

Habitat diversity (composition and quality) is another indicator of aquatic habitat conditions and is assessed as the quantity and degree of development of various types of aquatic habitat (*e.g.* pools, riffles). Stream segments possessing numerous habitats with a wide variety of stream velocities, water depths, and physical habitat configurations are considered more diverse and have a greater potential for meeting the habitat requirements of naturally reproducing trout populations. Removal of riparian vegetation, which reduces instream wood, along with increases in bedload and sediment, and changes in stream morphology can affect the composition and quality of habitat.

Cover complexity is also an indicator of habitat conditions and is evaluated by the degree of habitat partitioning by various structural elements such as large woody debris (LWD), boulders, and undercut banks. This physical separation within habitat units can help maximize fish production by decreasing competition and aggression, reducing predation, increasing carrying capacity, and producing micro-habitat conditions that minimize energy requirements and provide refugia for fish inhabitants. The same surrogates used to reflect changes in habitat diversity are used to display changes to cover complexity, particularly instream wood and channel morphology.

Channel stability is another indicator of fish habitat conditions because it influences the quality of pool habitat as well as helps to establish the trend for aquatic habitat conditions. Channel stability is discussed in the Water Resources report and incorporated into the assessment of fisheries resources. The relationship between upslope processes and stream channel condition were also assessed by incorporating the analysis of the hydrologic condition within the project area. Changes to channel stability are highly dependent upon changes in water yield and timing, and bedload movement. Other selected features that are believed to influence the condition of riparian areas, and subsequently fish habitat are also discussed.

Measures of Change - Indirect effects
Because of the difficulty of directly measuring stream habitat components as well as delay between land management actions and altered stream conditions, this EIS will be tracking management actions that could alter stream conditions. The relationship between the habitat component and the measurement of change is discussed below.

Riparian Harvest: For this EIS, the amount of riparian harvest will be a surrogate for changes in stream temperature, habitat diversity, cover complexity, and channel stability. The direct effect of riparian harvest is the reduction of shade and large wood component near streams. The indirect effects of reducing the amount of streamside vegetation include altering timing and amount of sediment delivery, wood loading in stream, stream temperature, and the hydrologic regime (Meehan et al. 1991). The cumulative effects of riparian harvest can be reduced egg-to-fry survival (by increased fines in redds) and reduce adult survival (by increasing temperature outside of tolerated range and/or by altering carrying capacity by reducing highly utilized habitat) of MIS species. For purposes of consistency in this analysis, an average distance of 300 feet from fish bearing stream will be considered as riparian habitat. Although not all the vegetation within this 300 foot buffer from stream will consist of vegetation that is dependent on the water table, it does provide conditions necessary to maintain these types of vegetation (FEMAT, 1993). In addition, riparian harvest within approximately 75 feet of intermittent streams will be considered riparian harvest. By maintaining riparian habitat, the Forest will trend toward meeting the large woody debris Riparian Management Objective in INFS.

Sediment Delivery Risk: The greatest risk is at stream crossings, where culvert failures can introduce large amounts of sediment into stream channels. If crossings fail, a direct effect of sediment delivery can be reduced passage of fish; however, the most likely effects are indirect and cumulative in nature. The indirect effects of these failures include increased fine sediment in redds, and channel simplification due to torrents. The cumulative effects of additional sediment delivery can be reduced egg-to-fry survival (by increased fines in redds) and reduce adult survival (by altering carrying capacity by reducing highly utilized habitat such as pools) of MIS species. The cumulative effects related to road failures can ultimately lead to a decline in fish numbers (Furniss et al. 1991). By reducing the amounts sediment entering streams the result will be trending towards the Pool Frequency and the Width/Depth Riparian Management Objectives.

Increased Fish Passage: The placement of culverts at stream crossings can alter the ability of fish to access stream habitat above the culvert. The direct effects of modifying these culverts to allow for migration is increased fish passage. The indirect effects of fish passage is the movement of fish to portions of streams not previously used; however, replacement activities may increase short-term sediment production. The cumulative effects of increased passage is the increased probability of persistence of the MIS species. Passage for this analysis will be focused on spring migration of adult westslope cutthroat and summer/fall migration of bull trout.

Reduced Length of Encroaching Roads: The fourth of these surrogates will be the amount of encroaching road removed as a result of restoration activities. A direct effect of reducing the length of encroaching roads is reduced flow velocity. Indirect effects include increased habitat complexity and fish carrying capacity. Cumulative effects include increased numbers of fish. Because valley bottom roads pose a significant risk to fish (Dose and Roper 1994, Hick et al. 1991), reducing these roads is extremely important to maintaining the long-term viability of fish species, as well as maintaining terrestrial species within the basin that rely on riparian habitat. By reducing the amount or encroaching road the result will be trending towards the Pool Frequency and the Width/Depth Riparian Management Objectives.

Effects of the Alternatives on Management Indicator Habitat Components

Some activities, in addition to the activities described in the EIS are common to all alternatives and are described under "Reasonably Foreseeable Activities" (Appendix E). All future Federal decisions listed in Appendix E (Reasonably Foreseeable Activities) will need to complete consultation with the U.S. Fish and Wildlife Service prior to the decision. Each of these activities has the potential to contribute to various aspects of watershed resource conditions. Protective measures were recommended and incorporated into the designs for most of these projects allowing watershed resources to be maintained. Effects to fisheries

resources can be expected from these activities, and any action alternative under this analysis is considered to have additive effects when combined with No Action Alternative.

Direct, Indirect and Cumulative Effects at the Analysis Area Scale

Riparian Harvest: No timber harvest would occur within RHCA's for any alternative. As a result there would be no significant direct, indirect, or cumulative effect to the fisheries resource.

Sediment Delivery Risk: The short term effects are related to the number of new culverts crossing streams and the length of the new road. Any value greater than zero is a short-term increase in risk. In contrast, values in the long-term effects is the amount of annual risk of sediment delivery. Any value in these columns less than in Alternative A is a reduction in risk while any values greater than Alternative A is an increased risk.

Except in Skookum, all alternatives, including the no action alternative (Alternative A) would result in no decrease in the risk of failure at stream crossing in all watershed analysis areas. The lack of reduced risk is due to private lands which need many of the roads for access. Under all action alternatives, there would be road obliteration and associated culvert removal in the Skookum watershed analysis area. There would be short term sediment delivery to Skookum associated with the culvert removal and long term reduction in risk of sediment.

Table III-274. Sediment delivery risk, Newport planning area.

	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F		Alt. G	
Stream	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
Pend Oreille Face	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI
CCA (Browns)	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI
Skookum	0/0	NI	0/0	NI*	0/0	NI*	0/0	-1.0*	0/0	NI*	0/0	-1.0*	0/0	-1.0*
Indian Creek	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI
Browns Lake	0/0	NI	0/0	NI	0/0	NI	0/0	-1.3	0/0	NI	0/0	-1.3	0/0	-1.3
Marshall	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI	0/0	NI

Key to Table III-275

Data in the preceeding table is for inventoried stream crossings and roads used in alternatives.

ST = Short term, and is measured by miles of new road (temporary and permanent road miles/number of new stream crossings).

LT = Long term, and is the potential reduction (-) or addition of yearly sediment that could be delivered from the inventoried transportation system.

NI = no risk sites were inventoried.

An asterisk (*) means that known non-inventoried culverts would be removed, therefore the long term risk would be less than is quantified. Transportation systems include both non system and system roads. Risk reduction includes the upgrading and/or removal of stream crossings (risk of failure multiplied by sediment volume).

Increased Fish Passage: Alternatives that remove barriers to fish passage would be a benefit to the MIS species. There would be no increase in fish passage under any alternative. Because no action is taken at these stream crossings, there would be no significant direct, indirect, or cumulative effects.

Reduced Length of Encroaching Roads: Alternatives that reduce the length of encroaching roads would have a short-term increase in sediment but would result in the long-term benefit to MIS species.

All action alternatives would result in the reduction of encroaching roads. In the short term there would be an increase in fine sediment and reduction in cover where the road prism is currently in contact with the stream. Reduction of this encroachment in the long term would allow the stream courses to settle into a regime where the stream would be able to interact with the flood plain. Large wood recruitment would improve over time as these areas regenerate to forest and provide fallen trees into the stream and riparian areas. Habitat complexity would increase and provide more pool and hiding/resting habitat for fish. Sediment would slowly go into storage behind these obstructions, and should result in less bedload movement through the system. The short-term increase in sediment delivery in combination with the long-term benefit associated with the removal of encroaching roads would not result in a significant cumulative effect to the MIS within the cumulative watershed effect areas. Given the amount of encroaching roads within many of the cumulative effects areas, the benefits of restoration activities would be minimal but are a necessary first step towards restoration of these watersheds.

Table III-275. Reduced length of encroaching roads, Newport planning area (miles).

	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F		Alt. G	
Stream	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**	**ST**	**LT**
Pend Oreille Face	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
CCA (Browns)	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Skookum	nc	0	-	0.4	-	0.4	-	0.4	-	0.4	-	0.4	-	0.4
Indian Creek	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Bead Lake	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0
Marshall	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0	nc	0

***LT** = is the number of miles of encroaching road removed. **ST** = is a short-term increase in sediment, and **nc** means no change.*

Effects to Westslope Cutthroat Trout and Bull Trout Individuals and Populations

Definitions

The impact to Management Indicator Species will be described using the following definitions:

No change in population conditions means that there would likely be no net positive or negative effect to the population within the cumulative watershed effects areas. No change in riparian or stream conditions.

Likely to result in a long-term reduction in risk of past management actions to individuals indicates the action taken within the watershed is limited in nature but would result in a net benefits to individuals when compared to the existing condition. Actions that result in the reduction of risk to individuals include isolated culvert upgrades and small scale reduction of encroaching roads with little increased risk associated with road building or riparian harvest. A change in stream and riparian conditions so that Riparian Management Objective are trended towards at the segment or reach scale.

Likely to result in a long term reduction in risk of past management actions to population indicates the actions is broad enough in scope to effect individuals throughout the basin thereby improving the condition of the population within the cumulative watershed effects area when compared to the existing conditions. Actions that result in the reduction of risk to populations include widespread culvert upgrades, large scale reduction of encroaching roads, and/or increased fish passage without increased risk associated with road building or riparian harvest. A significant change in stream and riparian conditions so that Riparian Management Objective are trended towards at the subwatershed scale.

Likely to result in a long-term risk in individuals indicates the action taken within the watershed is limited in nature but would result in a net harm to individuals when compared to the existing condition. Actions that result in the increased of risk to individual include road building or harvesting riparian areas without a widespread effort to upgrade culverts and reduction of encroaching roads. A change in stream and riparian conditions so that Riparian Management Objective are trended away from at the segment or reach scale.

Likely to result in a long-term decline in populations indicates the action taken within the watershed is widespread and would result in a net harm to individuals when compared to the existing condition. Actions that result in the increased of risk to populations include widespread road building without a widespread effort to upgrade culverts and the reduction of encroaching roads. A change is stream and riparian conditions so that Riparian Management Objective are trended away from at the subwatershed scale.

The following tables portray effects of the ongoing, and proposed activities, and are designed to show the trend that would be attained with each of the alternatives, by watershed analysis area. These calls integrate the preceding evaluations of habitat components and the foreseeable actions described above. The X'd blocks are the composite rating of the cumulative effects of the all actions in an alternative on the MIS species and summarized by the cumulative watershed effects areas.

Effects of Alternative A

Table III-276. Effects to MIS species, Alternative A

Watershed	Likely to result in a long-term decline in popula-tions	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within basin
Pend Oreille Face			X			X	X
CCA			X				X
Skookum			X				X
Indian Creek			X				
Bead Lake			X			X	X
Marshall			X			X	X

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no basin has a strong population of cutthroat and only Indian Creek has a known population of bull trout. Although some of the decline is related to Federal Land management actions much of the decline is the result of activities on private lands. The population trend of cutthroat has been a rapid decline and will likely stay depressed because of private land management in the checkerboard ownership. Because the actions only have effects at the stream reach scale, this project would have no incremental effect at the scale of the watershed. This no action alternative does not increase the level of risk to these species by timber harvesting or improve the condition as a result of restoration.

Effects of Alternative B

Table III-277. Effects to MIS species, Alternative B

Watershed	Likely to result in a long-term decline in popula-tions	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within basin	DIRECT AND INDIRECT EFFECTS Positive Components	DIRECT AND INDIRECT EFFECTS Negative Components
Pend Oreille			X			X	X		
CCA (Browns)			X				X		
Skookum				X			X	Reduced risk, Reduced encroaching road	
Indian Creek			X						
Bead Lake			X			X	X		
Marshall			X			X	X		

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no basin has a strong population of cutthroat trout and only Indian Creek has a known population of bull trout. Although some of the decline is related to Federal Land management actions. Much of the decline is the result of activities taken on private lands. The population trend of cutthroat trout has been a rapid decline and will likely stay depressed because of private land management in the checkerboard ownership. The effects of Alternative B would result in no change in the existing condition of all watershed areas except Skookum. In contrast, there would be a benefit at the scale of a stream segment in Skookum. Because the actions only have effects at the stream reach scale, this project would have no incremental effect at the watershed scale.

Effects of Alternative C

Table III-278. Effects to MIS species, Alternative C.

Watershed	Likely to result in a long-term decline in popula-tions	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS Positive Components	DIRECT AND INDIRECT EFFECTS Negative Components
Pend Oreille			X			X	X		
CCA (Browns)			X				X		
Skookum				X			X	Reduced risk, Reduced encroaching road	
Indian Creek			X						
Bead Lake			X			X	X		
Marshall			X			X	X		

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently no basin has a strong population of cutthroat and only Indian Creek has a known population of bull trout. Although some of the decline is related to Federal Land management actions much of the decline is the result of activities on private lands. The population trend of cutthroat trout has been a rapid decline and will likely stay depressed because of private land management in the checkerboard ownership. The effects of Alternative C would result in no change in the existing condition in all watershed areas except Skookum. In contrast, there would be a benefit at the scale of a stream segment in Skookum. Because the actions only have effects at the scale of a stream reach this project would have no incremental effect at the watershed scale. Alternative C would not increase the level of risk to these species by timber harvesting or improve the condition as a result of restoration.

Effects of Alternative D

Table III-279. Effects to MIS species, Alternative D

Watershed	Likely to result in a long-term decline in popula-tions	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS Positive Effects	DIRECT AND INDIRECT EFFECTS Negative Effects
Pend Oreille			X			X	X		
CCA (Browns)			X				X		
Skookum				X			X	Reduced risk, Reduced encroaching road	
Indian Creek			X						
Bead Lake				X		X	X	Reduced risk	
Marshall			X			X	X		

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no basin has a strong population of cutthroat and only Indian Creek has a known population of bull trout. Although some of the decline is related to Federal Land management actions much of the decline is the result of activities taken on private lands. The population trend of cutthroat trout has been a rapid decline and will likely stay depressed because of private land management in the checkerboard ownership. The effects of Alternative D would result in no change in the existing condition in all watershed areas except Skookum and Bead Lake. In contrast, there would be a benefit at the scale of a stream segment in Skookum and Bead Lake. Because the actions only have effects at the stream reach scale, this project would have no incremental effect at the watershed scale. Alternative D does not increase the level of risk to these species by timber harvesting or improve the condition as a result of restoration.

Effects of Alternative E

Table III-280. Effects to MIS species, Alternative E

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within basin	DIRECT AND INDIRECT EFFECTS Positive Components	DIRECT AND INDIRECT EFFECTS Negative Components
Pend Oreille			X			X	X		
CCA (Browns)			X				X		
Skookum				X			X	Reduced risk, Reduced encroaching road	
Indian Creek			X						
Bead Lake			X			X	X		
Marshall			X			X	X		

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently no basin has a strong population of cutthroat trout and only Indian Creek has a known population of bull trout. Although some of the decline is related to Federal Land management actions much of the decline is the result of activities taken on private lands. The population trend of cutthroat trout has been a rapid decline and will likely stay depressed because of private land management in the checkerboard ownership. The effects of Alternative E would result in no change in the existing condition in all watershed areas except Skookum. In contrast, there would be a benefit at the scale of a stream segment in Skookum. Because the actions only have effects at the stream reach scale, this project would have no incremental effect at the watershed scale. Alternative E does not increase the level of risk to these species by timber harvesting or improve the condition as a result of restoration.

Effects of Alternative F

Table III-281. Effects to MIS species, Alternative F

Watershed	Likely to result in a long-term decline in popula-tions	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS Positive Components	DIRECT AND INDIRECT EFFECTS Negative Components
Pend Oreille			X			X	X		
CCA (Browns)			X				X		
Skookum				X			X	Reduced risk, Reduced encroaching road	
Indian Creek			X						
Bead Lake				X		X	X	Reduced risk	
Marshall			X			X	X		

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no basin has a strong population of cutthroat and only Indian Creek has a known population of bull trout. Although some of the decline is related to Federal Land management actions much of the decline is the result of activities taken on private lands. The population trend of cutthroat trout has been a rapid decline and will likely stay depressed because of private land management in the checkerboard ownership. The effects of Alternative F would result in no change in the existing condition in all watershed areas except Skookum and Bead Lake. In contrast, there would be a benefit at the scale of a stream segment in Skookum and Bead Lake. Because the actions only have effects at the stream reach scale, this project would have no incremental effect at the watershed scale. Alternative F does not increase the level of risk to these species by timber harvesting or improve the condition as a result of restoration.

Table III-282. Effects to MIS species, Alternative G

Watershed	Likely to result in a long-term decline in populations	Likely to result in a long-term risk in individuals	No change in population conditions	Likely to result in a long-term reduction in risk of past management actions to individuals	Likely to result in a long term reduction in risk of past management actions to population	No WCT recently found within basin	No BT recently found within Basin	DIRECT AND INDIRECT EFFECTS Positive Components	DIRECT AND INDIRECT EFFECTS Negative Components
Pend Oreille			X			X	X		
CCA (Browns)			X				X		
Skookum				X			X	Reduced risk, Reduced encroaching road	
Indian Creek			X						
Bead Lake				X		X	X	Reduced risk	
Marshall			X			X	X		

Cumulative Effects

Historically, most of the above listed basins possibly had abundant populations of cutthroat trout or bull trout. Currently, no basin has a strong population of cutthroat and only Indian Creek has a known population of bull trout. Although some of the decline is related to Federal Land management actions much of the decline is the result of activities taken on private lands. The population trend of cutthroat trout has been a rapid decline and will likely stay depressed because of private land management in the checkerboard ownership. The effects of Alternative G would be no change in the existing condition in all watershed areas except Skookum and Bead Lake. In contrast, there would be a benefit at the scale of a stream segment in Skookum and Bead Lake. Because the actions only have effects at the stream reach scale, this project would have no incremental effect at the watershed scale. Alternative G does not increase the level of risk to these species by timber harvesting or improve the condition as a result of restoration.

Comparison of Alternatives for Benefits to Fish

Comparison of alternatives is based on the relative effects to fish-bearing streams from watershed restoration activities, harvest and associated fuels reduction (as related to risk of catastrophic fire). Alternative G shows the most potential benefit to fish-bearing streams because this alternative reduces the threats to fish without the slight increase in risk associated with timber harvest. Both alternative D and E are similar and positive in their effects to fish. In completing either of these alternatives, future fish habitat would be improved. There would be some increased short-term risk to fish in the harvesting of timber. This risk would be offset by the restoration activities in D and E. The Alternatives B, C, and E are similar to D and E, but given the lesser potential sale areas, the total amount of watershed restoration is less than D and E. Alternative A is the worst alternative for fish because it does not include restoration opportunities. Overall, there is little difference between alternatives relating to benefits to fish.

Effects of Opportunities

Additional watershed restoration projects (such as road obliteration, removal or improvement of stream crossing and placement of instream structures to benefit fish habitat) have the opportunity to be funded with this project. These projects could result in the short-term increase in sediment but in the long-term would benefit the Management Indicator Species. All future projects must be designed to meet the Forest Plan as amended by the Inland Native Fish Strategy and be reviewed by the District Fisheries Biologist prior to implementation.

Timber stand improvement would have no effect if conducted outside stream buffers.

Consistency with the Forest Plan and Other Applicable Regulatory Direction

Based on the information presented in this document all alternatives would meet the Forest Plan as amended by the Inland Native Fish Strategy. All alternatives use the standards and guidelines in the Inland Native Fish Strategy.

FUELS AND FIRE BEHAVIOR

CHANGES BETWEEN THE DRAFT AND FINAL EIS

In response to comments and recognition of errors in the Draft EIS, the Final EIS has changes in the fuels and fire behavior section. A brief summary of the changes are as follows: The Affected Environment section has been expanded to better describe the historic conditions and the actions that have led to current forest health problems. Additional analysis was completed for the Final EIS. The Forest Vegetation Simulator (FVS) was used. The Fire and Fuels Extension (FFE-FVS) integrates FVS with elements from existing models of fire behavior and fire effects. Model output displays fuels, stand structure, snags, and potential fire behavior over time and provides a basis for comparing proposed fuel treatments. Many wording and other editing changes have taken place to further clarify the descriptions of information provided. There is expansion on the description of cumulative effects and opportunities.

REGULATORY FRAMEWORK

The Colville Forest Plan objective is to provide cost efficient fire protection integrated with other resource management objectives. Fire management plans are to be guided by the following standards:

- *All wildfires will receive an appropriate suppression response. This response and the associated fire suppression strategies will be the most cost effective commensurate with land management objectives for the area on which wildfire occurs.*
- *Apply aggressive suppression action to wildfires that threaten life, private property, public safety, improvements, or investment.*
- *In most cases, when wildfires do not threaten to exceed acceptable sizes and intensities for the management areas, the lowest cost suppression option is appropriate.*
- *If a wildfire escapes initial action and threatens to exceed established limits, an escaped fire situation analysis shall be prepared. This analysis weighs the cost of suppression against the resource potential losses. Suppression actions should be appropriate for the values threatened, even on escaped fires.*

Many of the Forest Plan management areas in the Newport analysis area include the goal to manage suitable lands for timber production for the long-term growth and production of commercially valuable wood products. The fire protection standard to achieve that goal is to use initial attack strategies (confine, contain and control) appropriate to achieve the best benefit based on commercial timber values and where appropriate, recreation, scenery, and big game winter range values.

Forest Service policy is to evaluate, plan, and treat wildland fuel to control flammability and reduce resistance to control including mechanical, chemical, biological, or manual means (FSM 5150). This includes the use of prescribed fire to support land and resource management objectives. The objectives of fuels management are to:

- *Reduce fire hazard to a level where cost effective resource protection is possible should a wildfire ignition occur. Fire hazard is the potential fire behavior (intensity and rate of spread) of a fire burning in a given fuel profile and its ability to be suppressed by firefighting forces.*
- *Reduce the potential fire severity.*

Fire suppression policy from the early 1900's until the late 1970's has been that of total suppression. Only recently has fire policy been modified to recognize the importance of fire in balancing vegetation cycles within the temperate forest. The Federal Wildland Fire Management Policy and Program Review was chartered by the Secretaries of Interior and Agriculture to examine the need for modification of and addition to Federal fire

policy. The review recommended a set of consistent policies for all Federal wildland fire management agencies. In adopting the policy, the Federal Agencies recognized that wildfire has historically been a major force in the evolution of our wildlands, and it must be allowed to continue to play its natural role wherever possible. It was also recognized that all Agencies will not necessarily employ all identified procedures on all administrative units at all times (USDI, USDA, 1995; USDI, USDA, 1996). The severe wildfire seasons in northern California and Oregon in 1987, in Yellowstone Park, and the Northern Rocky Mountains in 1988, throughout much of the West in 1994, and Florida and Texas in 1998 have made it clear that fire cannot be excluded from fire-dependent ecosystems. On the other hand, because of development, and commercial forests, fire cannot be fully restored to its historic character, except perhaps in a few of the largest wilderness areas (USDA, 1996.)

AFFECTED ENVIRONMENT

As described in the previous section, fire is the major disturbance factor that produces vegetation changes in our ecosystems. If the role of fire is altered, or removed, this will produce significant changes in the ecosystem. Fire has burned in every ecosystem and virtually every square meter of the coniferous forests and summer-dry mountainous forests of northern Idaho, western Montana, eastern Washington and adjacent portions of Canada. Fire was responsible for the widespread occurrence and even the existence of western larch, lodgepole pine, and western white pine. Fire maintained ponderosa pine throughout its range at the lower elevations and kills ever-invading Douglas-fir and grand fir (Spurr and Barnes 1980). Many ecosystems are regularly recycled by fire; life for many forest species literally begins and ends with fire. The effects of the historic disturbance factors, mostly associated with fire, and their current absence are discussed in more detail the forest vegetation section.

Definitions

Fuel - Combustible wildland vegetative materials, living or dead.
Return interval - Refers to how often a particular type of fire occurs.
Fire Severity - The amount of damage a fire actually causes. Fire severity is typically described as nonlethal, mixed, or lethal.
Nonlethal fires - fires that kill 10% or less of the dominant tree canopy. A much larger percentage of small understory trees, shrubs and forbs may be burned back to the ground line. These are commonly low severity surface and understory fires, often (but not always) with short return intervals (few decades).
Mixed severity fires - fires that kill more than 10%, but less than 90% of the dominant tree canopy. These fires are commonly patchy, irregular burns, producing a mosaic of different burn severities. Return intervals on mixed severity fires may be quite variable.
Lethal fires - fires that kill 90% or more of the dominant tree canopy. These are often called "stand replacing" fires and they often burn with high severity. They are commonly (but not always) crown fires. In general (but not always), lethal fires have long return intervals (140 - 250+ years apart), but affect large areas when they do occur. Local examples of these types of fires would be the Sundance and Trapper Peak fires of 1967 that burned over 80,000 acres in a relatively short time period during late summer drought conditions.

Approximately 56 percent of the Newport analysis area consists of dry Douglas-fir forest types. Historic fire regime in these types was variable, with shorter return interval non-lethal and mixed severity fires the norm and long-interval, large lethal fires occurring less frequently than on moist forest types (USDA 1997a). Approximately 41 percent of the Newport analysis area consists of moist cedar and hemlock forest types. Historic fire regimes in these types were variable, with long-interval, large lethal fires mixed with shorter return interval non-lethal and mixed severity fires (USDA 1997a). Three percent of the Newport analysis area consists of cool and moderately dry forest types. Fire return intervals in these types was highly variable, in the Priest Basin, the mean fire return interval was in excess of 150 years (Arno and Davis, 1980). ICBEMP

(USDA, USDI 1996) identified the historic fire regime for the majority of the Newport analysis area as frequent, non-lethal fire return ecosystem or frequent mixed severity ecosystem. The Newport analysis area is downwind from dry site flats adjacent to the Pend Oreille River where fire regimes would have historically been frequent and non-lethal. On dry years it would be common for these fires to spread into the uplands, resulting in a more frequent fire regime than commonly considered normal for moist sites. This frequency was noted on the Coeur d'Alene Ranger District (Zack and Morgan, 1994). On the Bonners Ferry Ranger District under similar conditions, fire return intervals in transition forests ranged from approximately 23 to 63 years on Hall Mountain and Skin Creek transition sites (data in project file).

The fire history analysis of the Coeur d'Alene Basin conducted by Zack and Morgan in 1994 drew the following conclusions that are also applicable to other forests with similar fire regimes such as the forests within the Newport analysis area :

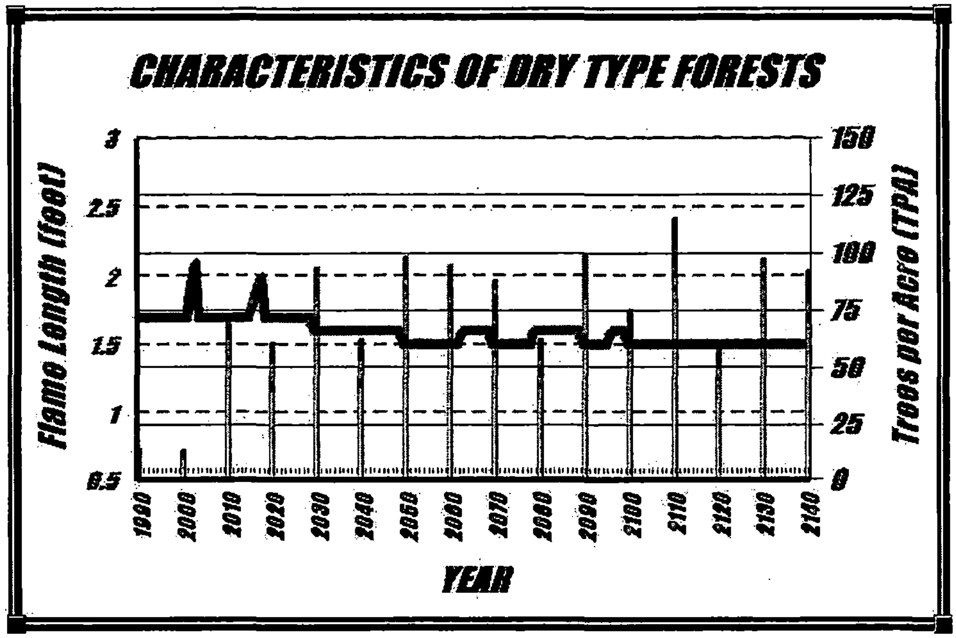
- *In addition to cycling carbon and nutrients, the infrequent large lethal fires played a dominant role in resetting the successional sequence and structuring the vegetation matrix across the landscape. However, the nonlethal and mixed severity fires were also important. Most stands (within the Coeur d'Alene Basin) apparently experienced an average of one to three of these low severity burns between lethal fires. These lower severity fires would reduce ground fuels, reduce ladder fuels, thin stands, and favor larger individuals of fire resistant species (larch, Douglas-fir, and ponderosa pine), than if these mixed severity and nonlethal fires had not occurred.*

- *Lower severity fires structured how the landscape responded when a lethal severity fire did occur. The lower severity fires increased the proportion of the landscape with big trees and open canopies that would not sustain a crown fire. Reduction of ladder fuels would mean that even high intensity fire might not reach tree canopies in some cases. The larger trees that grew as a result of the thinning would be more likely to survive even intense fires. The net result would be that even mostly lethal severity fires would be likely to leave more individual residual trees and patches of residual trees than if the lower severity fires had not occurred. The effects of lethal fire events would be less uniform as a result of the lower severity fires.*

- *Regional climate change operating on the scale of decades and centuries may be implicated in the major fire patterns observed. The historical record shows that some relative recent fires were quite large. In particular, the 1919, 1910, and 1889 burns were very large and severe both in the Coeur d'Alene Basin and throughout the Northern Rocky Mountains. Other dates such as 1542, 1738, 1764, 1772, 1814, 1830, and 1859 appear to be regional episodes. This strongly suggests that regional climate patterns are responsible for many of the major fire episodes on the Coeur d'Alene.*

There are several reasons for the departure from historic stand structure now evident on the Newport District. Timber harvesting began in the 1890's. Ponderosa pine, white pine and cedar were most valuable, larch and Douglas-fir were used for railroad ties and mine timbers. By 1900 a major portion of mature ponderosa pine stands had been harvested and either converted to other uses or were regenerating to dense, often mixed-species stands. Prior to 1960 many upland areas were high-grade logged, removing only the valuable species, resulting in major stand conversions to grand fir, hemlock, and Douglas-fir. Accounts of early day logging are presented in greater detail in the vegetation section. Since the late 1930's, fire control efforts have become effective. The primary impact of fire control has been to eliminate underburns and mixed severity fires which served as the thinning agents that favored larch and ponderosa pine. These mixed severity fires also generated some large fuels, and did not occur frequently enough to maintain open understories across large landscapes. Overall, in northern Idaho and northeastern Washington, moist habitat types tended to be a mosaic of forest stand structures and densities, but dense stands were common. In 1909 white pine blister rust was accidentally introduced to western North America. This Eurasian disease devastated white pine forests (Zack, 1995). With the lack of thinning described above, western larch starts a rapid decline by age 80 and ponderosa pine by age 130 (USDA 1994, PNW-GTR-320). These cumulative effects of 100 years of past activities have created large amounts of young stands comprised of tolerant species.

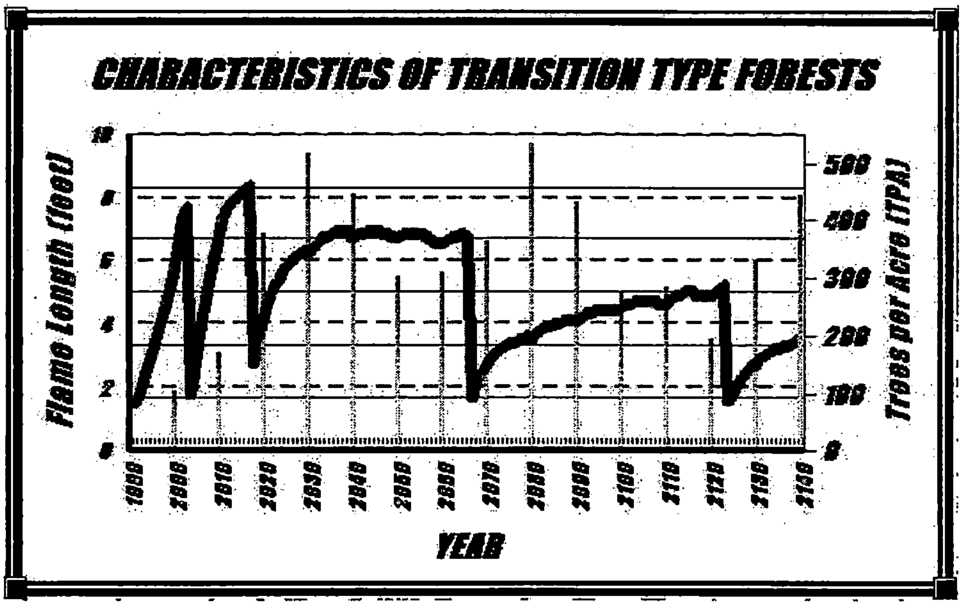
Figure III-15. Estimated trees per acre under a 20-year fire return interval in dry-type forests, and predicted flame length should a wildland fire occur.



The changes that have occurred in western warm, dry forests have been well documented. With effective exclusion of underburning in this century, warm, dry forests quickly became overstocked, often exceeding carrying capacity. In the absence of fire, native insects and pathogens regulate stocking by killing susceptible individuals and species. Frequent underburning also prevented excess accumulation of carbon and nutrients in woody biomass. The balance between fire and biological decomposition in regulating carbon accumulations in these forests has been disrupted. A current danger is stand replacing wildfire with fuel accumulations so high that burns are extremely hot, resulting in critical reductions of stored nutrients, with accompanying loss in potential productivity. The effectiveness of fire prevention and suppression has permitted increased ground fuel accumulations and stratified fuels (both living and dead) to the point where many fires can not be contained or confined. They now burn hotter and more extensively than even 10 years ago. This effect has been especially evident in dry forests that historically burned frequently (Harvey, 1984). Data collected on the IPNF suggests that the historic fire return interval on the Idaho Panhandle and Colville National Forests is highly variable on dry sites (Zack and Morgan 1994). Data from Priest Lake on small, isolated dry sites indicate a fire return interval of approximately 60 years (IPNF SO lobby display). On the Bonners Ferry Ranger District, fire return intervals were approximately 25 years on Hall Mountain dry sites (data in project file). The following figure displays modeled simulations of the effects that a 20 year fire return interval could have on a typical old growth ponderosa pine forest. Values displayed represent potential flame lengths over time should a wildland fire occur, and the number of trees per acre that could occupy the site over time.

Predictions were made using the FFE-FVS model, described later under Environmental Consequences, methodology section.

Figure III-16. Estimated trees per acre under a 50 to 60-year fire return interval in transition-type forests, and predicted flame length should a wildland fire occur.



In contrast with warm, dry forests, biological decomposition in warm, moist forest is substantial and the role of fire in nutrient cycling is reduced. Conversion of tall, well-spaced white pine forests to low, densely stratified Douglas-fir and true fir forests results in hazardous fuel ladders. Transition forests (warm, dry to warm, moist) possess most of the features of both dry and moist forests. Landscapes were historically a complex patchwork of stands resulting from fires that produced both lethal and non-lethal effects. Due primarily to the influences of fire exclusion and selective logging, as previously discussed, modern day transition forests are far more homogeneous than historical forests. Loss of landscape diversity is primarily associated with increasing dominance and layering of shade-tolerant species in stands previously dominated by open-growing ponderosa pine or other seral species. On areas that transition to moist forest types, the historic forest species composition was mixed with pines and larch playing a more dominant role than today. Mixed severity fires are now an improbable occurrence in many transition forests (Harvey, et.al. 1995, USDA 1999). Data collected on the IPNF suggests that the historic fire return interval on the Idaho Panhandle and Colville National Forests is highly variable (Zack and Morgan 1994). On the Bonners Ferry Ranger District, fire return intervals in transition forests ranged from approximately 23 to 63 years on Hall Mountain and Skin Creek transition sites (data in the Fuels/Fire section of the Project File). Figure XXX displays modeled simulations of the effects a 50 to 60 year fire return interval could have on a mixed species forest over a 140 year time period. Values displayed represent potential flame lengths over time should a wildland fire occurr, and the number of trees per acre that could occupy the site over time.

Although increases in volume and stocking are not as evident in moist forests as in dry and transition forests, some excessive fuel buildups have developed. Fuel accumulations associated with blister rust mortality can be substantial, and increasing accumulations of dead Douglas-fir and true firs associated with root disease mortality is expected. Additionally, conversion of tall, well spaced white pine to low, densely stratified fir results in hazardous fuel ladders. Thus, significant changes in fire behavior are also a characteristic of modern-day, moist interior forests. Such changes in fire behavior threaten future fire control and place neighboring forest ecosystems at risk (Harvey, 1984).

A significant change from common historic patterns is indicative of unhealthy conditions. Application of this concept to most north temperate and boreal forests characteristic of the western interior of the United States suggests many are unhealthy, especially where historical fire regimes have been significantly interrupted (Harvey, 1984, US GAO, 1999a and 1999b). The GAO report and testimony address the extent and seriousness

of problems related to the health of national forests in the interior West, the status of efforts by the Department of Agriculture's Forest Service to address the most serious of these problems, and barriers to successfully addressing these problems and options for overcoming them.

The Colville National Forest averages 41 fires per year with an average burned acreage of 3,016 acres per year (1984-1995 NFMAS analysis; on file Colville Supervisor's Office). With the exception of the White Mountain and Copper Butte fires (1988 and 1994, respectively), fires on the Colville since the 1930"s have also not been to the same scale as historic fires.

On sites where there have been weather and insect-related disturbances, we are accumulating fuel. The same types of disturbances under historic conditions could have led to similar fuel accumulations. Historically, similar fuel conditions led to stand replacing fires when suitable weather conditions presented themselves (Leiberg 1897, Spurr and Barnes 1980) .

ENVIRONMENTAL CONSEQUENCES

Methodology

Of primary concern to fuels management is the long-term fuel loading increase and subsequent changes in fire intensity and severity that may occur as a result of the Douglas-fir bark beetle outbreak. A team of specialists was convened on the IPNF to assess the bark beetle epidemic. The "Outbreak Incident" Assessment team was brought together to assess the magnitude of the outbreak to date, project its future behavior, and develop both short and long-term strategies for treatment. A report documents the Assessment Team's findings and recommendations (USDA, 1998c). The purpose of the Fuel Loading analysis conducted for the broadscale assessment was to project the total additional fuel tonnage, on a per acre basis, that could potentially be made available in stands where there is potential for Douglas-fir bark beetle mortality.

Site specific analysis done for the DEIS followed the same process outlined in the report, but instead was based on the actual observed and predicted extent of mortality to determine the potential increase in fuel loading and the number of snags created per acre (detailed results are located in the project file). The total tonnage of fuel that would be removed through harvest was calculated for each alternative, and results are documented in the fire/fuels section of the project file. Ten year old Douglas-fir bark beetle areas were studied and fuel surveys were completed as a check of assumptions made in the outbreak assessment report. Those findings and the analysis process were documented in a report (USDA, 1998a). Based on comments received on the DEIS, additional analysis was completed for the FEIS. For this additional analysis, stands were selected from those used in the fuel accumulation analysis. The analysis was conducted to determine differences in potential fire intensities and severities that could result from different management strategies. A sample of stands was selected that represent the full range of habitat type groups and a full range of predicted fuel load increases within the area due to the bark beetle infestation.

The Forest Vegetation Simulator (FVS), widely used by forest managers throughout the United States and Canada to predict the effects of various vegetation management actions on future forest conditions was used for this additional analysis. The Fire and Fuels Extension to FVS (FFE-FVS) integrates FVS with elements from existing models of fire behavior and fire severity. Model output displays fuels, stand structure, snags, and potential fire behavior over time and provides a basis for comparing proposed fuel treatments (USDA, 1998b; USDA 1997c). A full description of the model is contained in the project file.

The most recent Douglas-fir bark beetle outbreak on the Colville and Idaho Panhandle National Forests occurred in 1987 and 1988 on the Coeur d'Alene River and St. Joe River Ranger Districts on the IPNF. Three of these sites in the Eagle Creek Drainage on the Coeur d'Alene River Ranger District were studied to determine the fuel loading potential from killed trees and the amount of fuel on the ground and available for wildfire (survey results and documentation are located in the project file).

At these sites, approximately one quarter of the available fuel (from beetle killed trees) was on the ground. The limbs over one inch were still sound, tree boles were suspended above the ground and still provided sound fuels. Fuels less than one inch were mostly absent due to decay. Regeneration of shade tolerant species was starting to occur. There were more fine live fuels, grass and low brush, present in the open areas than under the adjacent timber canopies. Sufficient grass was available in some locations to carry a fire. Existing fuel loadings were determined by conducting fuel survey transects in the selected bark beetle kill centers. Transects were designed consistent with protocol established by Brown (1974) and Jain (1998). The total estimated potential fuel loading from beetle killed trees at these sites ranged from 72 to 122 tons per acre; the average existing down woody fuel loading varied from 28 to 47 tons per acre.

Vegetation and fuels conditions will change over time as a result of the Douglas-fir beetle infestation. Stand succession in these areas can be predicted based on observations noted above and trends documented in the Outbreak Incident Assessment (USDA, 1998c). Changes in stand structure and forest fuels will go through several stages. Tools are available to measure the effect of these changes on wildfire, should one occur. The Forest Vegetation Simulator (FVS) was one tool used for this analysis. Full description of the model, input and output tables for all stands analyzed, and graphs that show the range of outputs for stands analyzed are contained in the project file.

Fire behavior depends on forest density, composition, amount of surface fuel, its arrangement, moisture content, prevailing weather, and physical setting. To characterize surface fire behavior, 13 fire behavior fuel models are available that describe the fuel complex, fuel loading, fuel bed depth, and moisture of extinction (upper limits of fuel moisture beyond which a fire will no longer spread with a uniform burning front) in dead and live fuels for grass, shrub, timber, and logging slash groups. These models in combination with dead and live fuel moisture content, slope angle, and wind speed provide a basis for predicting both fire spread rate and intensity (USDA, 1999a).

Fire spread rates and intensities can be predicted for various fuel types using the BEHAVE model. BEHAVE is an interactive computer system designed to predict or estimate fire behavior characteristics needed for fire management purposes. It is composed of the latest state-of-the-art simulation models developed for fire and associated fuel and environmental parameters. BEHAVE has evolved over several years in conjunction with the material developed for training fire behavior officers at the National Advanced Resource Technology Center in Marana, Arizona. The parameters that the Douglas-fir beetle will affect are the fuel models. As affected timber stands go through successional changes, fuel models that describe how a fire would react within the stand would also change.

Although fire was a significant disturbance on the landscape, its intensity and severity was variable, as discussed above. It is important to separate fireline intensity from fire severity. Intensity is the energy release rate per unit length of fireline, and is a physical parameter that can be related to flame length. It can be determined from the product of biomass consumption (energy) and rate of spread of the fire. Fire severity is an ecological parameter that measures, albeit somewhat loosely, the effects of the fire. Two fires of the same fireline intensity can have quite different effects between an old-growth mixed-conifer forest and a young plantation of similar species because the smaller plantation trees will be more easily scorched and have thinner bark. The fire in the old-growth may be of low severity while the plantation fire is of high severity. Land managers are generally more interested in fire severity, but must approach severity first by estimating fireline intensity and then using models such as the First Order Fire Effects Model (FOFEM) to predict tree mortality from fireline intensity (Agee, J.K. 1996).

Federal Wildland Fire Management Policy is to provide for firefighter and public safety as one of the first priorities. The deaths of 34 firefighters in 1994 focused the fire community's attention on wildland fire, and resulted in numerous initiatives at the federal and state levels to improve firefighter safety. One such study was conducted on wildland fire fatalities in the United States between 1990 to 1998 (USDA Forest Service, 1999b) "Falling snags (dead standing trees without leaves or needles in the crowns) killed four wildland firefighters. Although this hazard has resulted in relatively few deaths, and none have occurred in the past

four years, the risk of death or injuries from falling snags remains a serious concern. The deterioration of forest health in the western United States has resulted in enormous areas of forested land becoming susceptible to wildfire. Snags typically have much lower fuel moistures than live green trees and burn more readily. While burning, snags often throw spot fires far in advance of the main fire, and often burn through more quickly than green trees, falling with little or no warning. Approximately 5 years following the beetle infestation, Douglas-fir snags would contain sufficient rot in the top third of the tree that could burn off in a few hours (Harvey and Wright, 1967). The risk of injuries from falling snags increases during the night operational period when visibility is greatly reduced. While the cooler night time period is generally a more effective time to gain control on wildfires, the increased risk from unseen falling snags may limit the widespread use of crews at night in areas of dead and dying timber. Firefighters need to be aware of the dangerous and often life threatening conditions that falling trees and snags can create during all aspects of firefighting in forested areas. In fact, falling trees and snags are one of the leading causes of death and injury for wildland firefighters (Valdez, M. and Style J.R. 1996).

Where larger fires involve numerous snags per acre, a serious safety hazard exists. In such cases, because of increased safety awareness, it has become common practice for the firefighters to back away from a fire's edge a sufficient distance to allow time to create a safe work environment to construct, burn out, and hold fire lines. This form of fire fighting is often referred to as "indirect attack". Indirect attack often results in more acreage burned and especially in timber types, an increased risk of escaped fire.

Effects of the Alternatives

Direct and Indirect Effects Common to All Alternatives

Once forest canopies are opened, structural changes begin to take place in the surface vegetation. As more sunlight reaches the ground, more grass and brush species can grow and conifer regeneration begins. Fuel models used for estimating fire behavior would also change. Stands reviewed on the Idaho Panhandle National Forest (USDA 1998a), ten years following a Douglas-fir bark beetle infestation went through the expected surface fuel changes. In adjacent portions of the stands that were unaffected by the bark beetle, the stands represented fuel models 8 and 10, closed canopy timber stands. Fire in the portions of these stands affected by the bark beetle would now react as a shaded grass fuel model (model 2) or a brush model (model 5 or 6). This condition would last for several years. Rates of spread would increase compared to a model 8 or 10 (please refer to the table below). Since the stands would be more open, atmospheric conditions would have more effect on the fuel, fuels would dry quicker and more wind could penetrate the forest canopy to fan flames.

Trees that are killed by the beetle will stand for several years and therefore will not immediately become available ground fuel that would influence fire activity. By 15 years all branches and large limbs will have fallen, approximately 50 percent of the snags will have fallen also; greater than 90 percent of the snags will fall within 35 years (USDA, 1998b). The fuel accumulation rate will far exceed the decay rate for several decades. Decay rates for material greater than 3 inches in diameter can be expected to be near 1.5 percent per year; decay rates for limbs in the 1 to 3 inch size class should be near 9 percent per year (USDA 1998b). In affected stands, within 10 to 15 years, fuel conditions will start to resemble a fuel model 10, a timber stand with heavy down material and fuel ladders that enable a surface fire to climb into the crowns or a fuel model 11 or 12, a stand with heavy debris or often referred to as a slash model. Since the stands would still be fairly open and contain more grass and brush or regeneration than a dense timber stand, spread rates may resemble a grass or brush model while intensities may start to resemble that of a fuel model 10, 11, or 12. These conditions are similar to those found by Leiberg (Leiberg, 1897) that historically contributed to severe stand replacing fires in the Coeur d'Alene basin.

Table III-283. Rate of spread and flame length for each fuel model, Newport analysis area.

Fuel Model	Rate of Spread (chains per hour)		Flame Length (feet)	
	normal precipitation	drought	normal precipitation	drought
2	25	32	5.3	6.3
5	11	27	3.4	6.7
6	28	34	5.6	6.4
8	2	2	1.0	1.2
10	7	10	4.5	5.7
11	6	7	3.4	3.7
12	13	15	7.9	9.0

Values in the table were predicted using the BEHAVE model and constant weather and fuel moisture conditions to show changes in fire behavior as fuel models change. Two sets of values were used for calculations. The first set represents fuel conditions commonly found during normal summers in the inland Northwest and the second set represents fuel conditions commonly found during drought conditions (NWCG, 1992). The differences between a fuel model 8 and a grass model 2 or brush model 5 or 6 is even more pronounced during drought conditions.

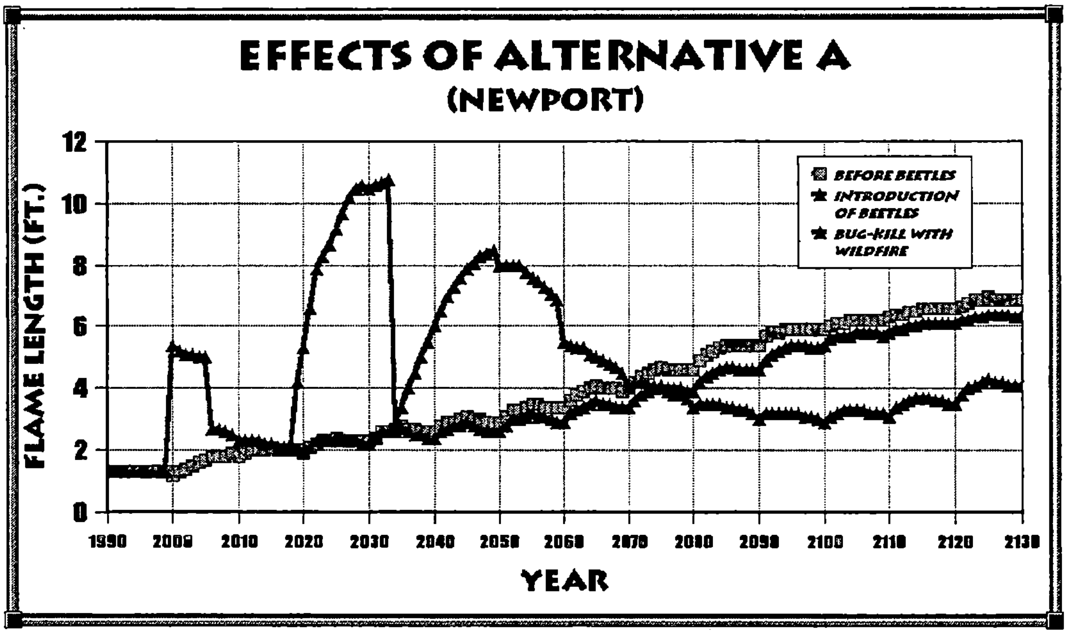
Definitions

Rate of spread - Forward rate of spread of the fire, expressed in chains per hour. One chain equal 66 feet.
Flame Length - The distance measured from the tip of the flame to the middle of the flaming zone at base of the fire, is valuable in determining type of resources necessary to fight fire by direct attack methods. Hand crews can normally suppress fires with flame lengths up to 4 feet, equipment is necessary when flame lengths are between 4 and 8 feet , aerial support is needed for fires with flame lengths up to 11 feet. Direct attack is not effective on fires with flame lengths over 11 feet.

Alternative A

Direct and Indirect Effects

Figure III-17. Predicted effects of a natural process of fuel accumulation and change prior to the beetle infestation (No-Action Alternative), effects of fuel conditions created by the beetle infestation, and effects of beetle-related fuel accumulation and wildfire.



Alternative A is the No Action Alternative, under which there would be no change from current management direction or from the level of management intensity in the area. Timber harvest, reforestation, watershed rehabilitation, and road obliteration activities, in connection with the Douglas-fir beetle infestation, would not be initiated at this time. The effects analysis reflects existing conditions and the anticipated effects of the Douglas-fir beetle infestations if no actions are taken.

Figure III-17 displays the results of the FFE-FVS model outputs for one stand on the Newport District. These results are typical for stands modeled across the three districts and represent a mid-range effect (Reinhardt, 1999). As depicted, fuel loadings and flame lengths of a wildfire would be expected to increase over time as a forested stand matures and surface fuels accumulate faster than the decay rate. Because of the beetle-induced changes in stand structure, these changes would occur at an accelerated rate. The immediate effect would be for increased wind penetration into forested stands, which in the event of a fire start, would increase flame lengths and rates of spread. In successive years, the model depicts the effects of surface fuel loading changes as portions of limbs and tops from the beetle killed trees fall to the ground. As the dead fuel accumulation from the beetle-killed trees slows, increases in regeneration provide fine fuels necessary to maintain flame lengths and spread rates. Intuitively, fire professionals know that heavy fuels increase flaming and smoldering time periods, thus increasing severity, even though the existing generation of fire behavior models do not account for this characteristic (Reinhardt, pers. comm, 1999).

The trends displayed by the graphs represent a natural process of fuel accumulation and change in stand structure over time. Similar changes in ecosystem structure in the past have undoubtedly contributed to the fires, from lethal, stand replacing to low severity underburns, that recycled inland ecosystems. Where the disturbance regime was repeated, the historic fuel loading and potential flame length pattern for ecosystem fires would have been erratic, similar to the line shown in Figure III-17 for a series of wildfires that could burn in fuel conditions created by Douglas-fir beetle. The graph should not be interpreted as displaying a

prediction as to when such a disturbance might occur, but rather a representation of changes such an event could cause on stand characteristics that influence fire intensity and severity. After fire occurrence, the fuel loading and potential flame lengths would be reduced while fuel accumulated from trees killed by the fire. After several years of fuel accumulation, the potential would rapidly increase, which would explain the repeat burns historically common to inland forests (Leiberg, 1897; Zack and Morgan 1994). Following these reburns the potential would be low for several years as forests became reestablished. This same process controls stand density levels and species composition.

The effects of no action are presented in a range. Both Region 1 and Region 6 Entomologists have predicted that the Douglas-fir bark beetle epidemic will continue for 2 to 4 years killing additional timber in stands that exhibit characteristics preferred by the beetle. The first figure presented below represents the effects of the current infestation levels, and the second figure represents the effects of the projected extent of the epidemic. The actual acreage may be more or less than the projected level; there are too many factors that could influence the extent of the infestation to predict exactly how far the beetle will go. The values for fuel accumulation risk equate to the tons per acre of beetle killed trees that will be available to fall and become surface fuel for a ground fire. These values are in addition to existing fuel loadings.

Table III-284. Fuel accumulation risk under Alternative A, Newport Ranger District.

Fuel Accumulation Risk	Currently Infested Acres Untreated	Projected Infestation Acres Untreated	Treated Acres
Less than 40 tons/acre	1,172	1,280	0
Greater than 40 tons/acre	862	3,995	0

As discussed previously, maintaining seral species is an important step in sustaining forested environments that can adapt and sustain fire disturbances within the range of natural variability. Changes to structural stage and species composition are discussed in the Vegetation section of this FEIS.

Cumulative Effects

The effects of the Douglas-fir beetle on infested forested areas will be an acceleration of successional changes that the areas are currently going through. This beetle infestation on the Newport beetle analysis area is projected to cover approximately 5,275 acres out of approximately 31,000 acres of National Forest System land alone. This could represent the equivalent of three to five low to moderate severity fires and could provide fuels similar to historic conditions that lead to stand replacing reburns. Only 60% of the analysis area is National Forest System land; the remaining 40% of the analysis area is other ownership which is experiencing similar levels of beetle infestation. Combined with conditions on National Forest Systems lands, the potential for large stand replacing fires is increasing.

However, as stated earlier, most large stand replacing fires on the Idaho Panhandle and Colville National Forests are wind driven or the result of regional climactic patterns. Salvaging beetle-killed trees would have minimal effect on such an event. Also of significance is the fact that this alternative is a continuation of trending forested ecosystems further outside their range of historic species composition (see Chapter III, vegetation section).

Effects Common to All Action Alternatives

The Douglas-fir beetle outbreak in the analysis area presents long-term fire and fuels consequences. Significant accumulations of additional fuel and increased mortality resulting in an increase in snag density are expected. With the beetle-induced thinning in the overstory, regeneration of species tolerant to insects and disease will begin to occur. This provides the fine fuels necessary for a fast moving fire and the heavy down fuel loadings, contributing to higher than normal fire intensities. These conditions could persist for

several decades; combined, they present serious safety hazards to firefighters when suppressing fires in affected stands.

It is not possible or desirable to "fireproof" fire dependant ecosystems, but the potential of severe fire can be reduced by proactive land management. Federal land management agencies can mimic natural disturbances, but it is essential for managers to consider that current conditions may be considerably different than those conditions that occurred historically. Reintroduction of native processes such as fire without modification of structural patterns, fuel loadings, and spatial distributions can produce unpredictable and undesirable effects (USDA, USDI, 1996). Multiple treatments will be needed to regulate vegetation structure, composition, and associated biomass loadings. Long management horizons may be required to restore unhealthy ecosystems to more sustainable conditions. The most effective means to restore long-term forest health will be density and fuels management, plus regulation of species composition to improve the dominance and distribution of seral species (Harvey, et al., 1995, USDA 1999a). The use of prescribed fire alone for stand restoration would be largely ineffective (with spring burns), or downright harmful and wasteful (dry season burns) (Barrett, S. W. 1994). In the case of the Idaho Panhandle and Colville National Forests, the lack of an adequate seral species seed source would assure long term failure of vegetation restoration efforts without artificial regeneration of seral species.

Timber harvest would significantly affect both short and long-term fuel loading. Timber harvest converts unavailable aerial fuels into available surface fuels. Thus the risk of crown fire may be reduced while the risk of surface fire can be increased by adding fuel to the ground. An increased fire hazard and risk of ignition from timber harvest may result. Treatment of created fuels can reduce these risks.

The potential for a fire outside of proposed harvest areas, the overall fuel mosaic on the landscape, and future vegetation and fuel succession must be considered when planning fuels treatments. Natural stands, and particularly partial-cut stands that are not treated for fuels reduction, could experience greater fuel buildup over time than treated stands. Treating risk areas where harvest takes place in this timber sale entry provides an opportunity to reduce fuel loading and continuity within stands and over the entire analysis area.

Direct and Indirect Effects Common to Action Alternatives B, C, D, E and F

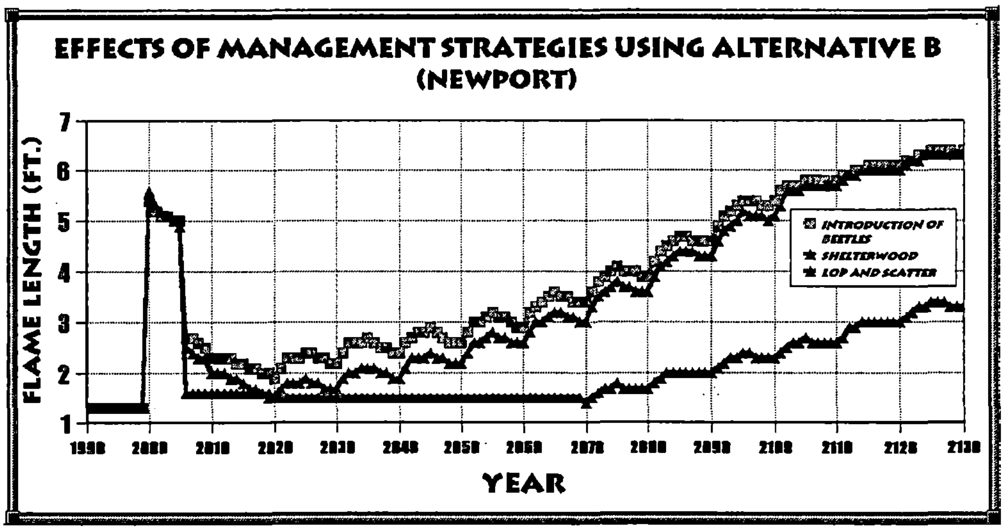
Any type of human activity increases the possibility of ignition and wildfire. Common ignition sources include equipment operation, smoking and arson. The timber purchaser will be required to have fire equipment and to take necessary fire precautions to prevent a wildfire from occurring. In the event of extreme fire conditions, the harvest activities would be regulated or suspended until conditions improve. The timber sale administrator closely monitors the fire prevention requirements of the timber contract throughout the timber harvest operations.

While these alternatives would treat some areas where fuel accumulation would be a concern, they do not treat all stands, especially if the beetle infestation continues as predicted by entomologists.

Figure III-18 displays the results of the FFE-FVS model outputs for one stand on the Newport District. These results are typical for stands model across the three districts and represent a mid range effect (Reinhardt, 1999). As depicted, fuel loadings and flame lengths of a wildfire would be expected to increase over time as a forested stand matures and surface fuels accumulate faster than the decay rate. Because of the bark beetle induced changes in stand structure, these changes would occur at an accelerated rate. The immediate effect would be for increased wind penetration into forested stands, which in the event of a fire start, would increase flame lengths and rates of spread. In successive years, the model depicts the effects of surface fuel loading changes as portions of limbs and tops from the beetle killed trees fall to the ground. As the dead fuel accumulation from the beetle killed trees slows, increases in regeneration provide fine fuels necessary to maintain flame lengths and spread rates. Heavy fuels increase the open flame and smoldering time periods, increasing severity.

Two different management scenarios were modeled; these include salvage logging with lopping and scattering of tops and a regeneration harvest system (shelterwood with reserves) followed with broadcast burning. As displayed in the figure below, salvage logging would increase potential flame lengths over the short term; this is because when these trees are harvested, all fuel would be on the ground instead of accumulating more slowly as under the no action alternative. Modeling completed for other districts found that yarding tops would reduce fuel loadings and potential flame lengths somewhat but would not eliminate the increases seen with other options because of breakage and increased solar and wind penetration into the stand. It was estimated that yarding tops would only remove 50 percent of the tops of harvested trees.

Figure III-18. Predicted effects of fuel conditions created by the beetle infestation, and effects of treatment proposed under Alternative B.



Dead Douglas-fir would be more brittle than green trees, so breakage of tops and limbs would be significant. Removal of all logging slash would not totally eliminate the potential for increased flame length should a fire occur because the extent of mortality would provide more open stand characteristics allowing increased wind and solar penetration.

As discussed previously, maintaining seral species is an important step in sustaining forested environments that can adapt to and sustain disturbances within the range of natural variability. Effects of these action alternatives on changes to structural stage and species composition are discussed in the Vegetation section of this Final EIS.

The values for fuel accumulation risk displayed in the table below equate to the tons per acre of beetle-killed trees that will be available to fall and become surface fuel for potential ground fires. These values are in addition to existing fuel loadings and equal untreated acreage after implementation of Action Alternatives.

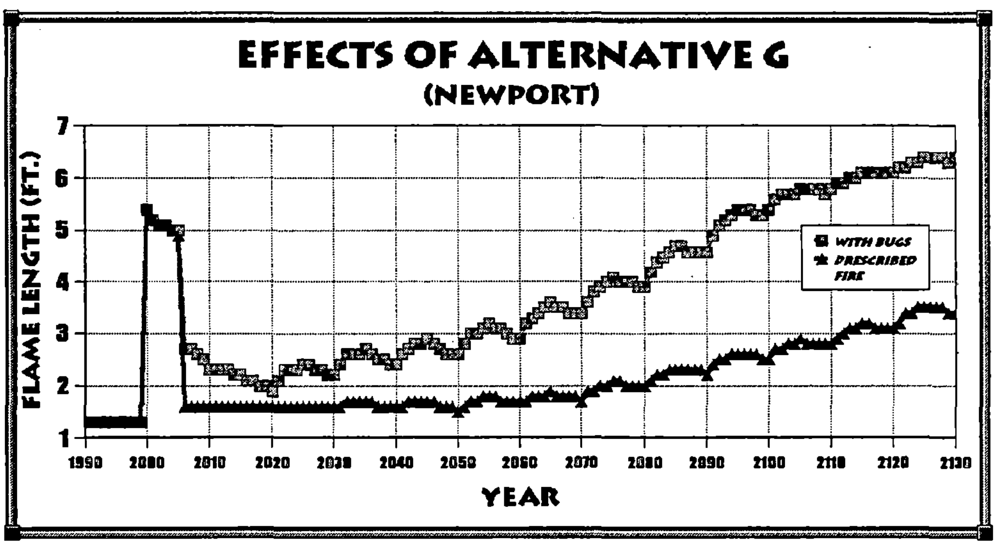
Table III-285. Fuel accumulation risk and proposed fuel treatment for Alternatives B through F, Newport analysis area.

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Fuel accumulation risk					
Areas with less than 40 tons/acre of beetle-caused fuel					
Acres to be treated	471	471	1,196	471	951
Acres to remain untreated	809	809	84	809	329
Areas with more than 40 tons/acre of beetle-caused fuel					
Acres to be treated	1,050	1,050	3,566	1,050	2,433
Acres to remain untreated	2,945	2,945	429	2,945	1,562
Proposed fuel treatment (acres)					
Prescribed fire	896	896	3,269	896	2,443
Lop and scatter	625	625	1,493	625	941
Total acres receiving a fuel treatment	1,521	1,521	4,762	1,521	3,384

Alternative G

Direct and Indirect Effects

Figure III-19. Predicted effects of fuel conditions created by the beetle infestation, and effects of treatment proposed under Alternative G.



Alternative G was developed to treat fuel accumulations without the use of timber harvest. Stands were selected for prescribed fire treatment based on the ability of fire managers to meet fuel and vegetation management objectives with prescribed fire. This alternative proposes 2,736 acres of prescribed fire.

The figure above displays the results of the FFE-FVS model outputs for one stand on the Newport District. As depicted, fuel loadings and flame lengths of a wildfire would be expected to decrease with implementation of a prescribed burning program. Sites modeled were dry Douglas-fir and grand fir sites. Stands in the Newport beetle analysis area do not have proper species composition to achieve vegetation management objectives within the near future. It would be necessary to plant desirable species to facilitate vegetation restoration, therefore only one prescribed fire application was applied. This treatment would be very similar to regeneration treatments of other alternatives. In cases where adequate canopy opening to allow regeneration of seral species was not achieved, repeat burning over a period of several decades may be required to allow reforestation of desirable species.

Table III-286. Fuel accumulation risk for Alternative G on the Newport Ranger District

Fuel Accumulation Risk	Untreated Acres	Treated Acres
Less than 40 tons/acre	340	940
Greater than 40 tons/acre	2,199	1,796

Table III-287. Fuel treatment for Alternative G on the Newport Ranger District

Fuel Treatment	Prescribed Fire	Lop and Scatter
2,736 Acres	2,736	0

Cumulative Effects Common to All Action Alternatives

As stated earlier, most large stand replacing fires on the Idaho Panhandle and Colville National Forests are wind driven or the result of regional climactic patterns. Salvaging beetle-killed trees would have minimal effect on such an event (USDA. 1998a). The scattered nature of regeneration units with underburning also would have minimal affect on such an event. Likewise, prescribed burning with Alternative G would have minimal effect. These alternatives do contribute to restoration of historic species composition, albeit in a small and scattered nature (see Chapter III, vegetation section).

Reasonably foreseeable future actions are listed in Appendix E. These future actions are not individually or cumulatively of a scale similar to historic disturbance patterns. Disturbances similar to historic proportions would be necessary to facilitate the vegetation restoration that is needed to change trends in potential fire intensities and severities. Foreseeable future actions would result in vegetation restoration at the stand scale.

Cumulative Effects on Private Lands

The amount of private land ownership within each analysis area was addressed in the previous vegetation section. The effects of Douglas-fir beetle mortality on other ownerships within the analysis area would be difficult to ascertain due to a lack of detailed information on current conditions and on how private land owners will treat beetle killed trees. In very general terms, non-industrial forest owners and industrial forest owners are likely to aggressively harvest dead and dying trees because of their commercial value. Owners of small home sites and recreational property are less likely to harvest their timber. Private landowners that do harvest trees are less likely to invest money in reforestation, so most regeneration will be from natural seeding.

Most information on vegetation and fuel conditions and planned treatments have been obtained from aerial photos, satellite imagery and personal knowledge. Some information on past and planned harvest and road building has been gathered from industrial owners and on state lands, but generally no specific information is available for non-industrial private landowners. The information that is known has been included in Appendix E.

In general, most private lands are on lower elevations and receive less moisture and are comprised of a higher percentage of dry sites than National Forest lands. There are industrial timberlands in some of the higher elevations. Some past harvests have been regeneration harvests that have created some openings in the forest canopy and have resulted in regeneration of seral species. But many existing openings, particularly in the lowlands, are a result of land clearing for homes and pastures. Other private lands are natural openings or meadow lands acquired through homesteading or other means.

More often, timber harvests on private lands tend to be partial cuts that remove trees of the highest economic value (usually the largest) and typically removes large fire-resistant seral species. Natural regeneration is

relied on to fill most created openings. This tends to favor shade tolerant Douglas-fir and grand fir over early seral species such as pine and larch. As previously discussed, the historic fire-adapted vegetation structure was lost early in the century. With increased rural/urban development, it is probably safe to say that inherent disturbance regimes and historic vegetation patterns will never be reestablished on a landscape scale. This pattern of vegetation change has led to increased fire intensities and severities and is expected to continue. Private lands are expected to be managed similar to the past.

Since private lands often include residences and other developments, fire will continue to be aggressively suppressed, although the potential for increased ignitions continues to rise as human use increases. Land management agencies in Northern Idaho and Eastern Washington are not advocating a return to historic disturbance regimes at the landscape level. Natural disturbance regimes included severe and rapidly moving forest fires that sometimes exceeded 100,000 acres. Over 500,000 people now live in an area that historically was inhabited by 5,000 - 10,000 Native American people. While the full range of historic fire regimes was a functional part of the historical natural ecosystem, we are now operating in an environment of a changed human context. Returning to the full range of historic disturbance patterns would generate significant threats to human life and property. Even smaller threats (eg Fire Storm 91) have not been acceptable to the public.

Effects of Opportunities

Timber stand improvement projects (pre-commercial thinning and pruning) are identified in the project file. Thinning redistributes growth and adjusts species composition for the future. Thinning would favor healthy trees of desired species adapted to the various habitat types. In the long-term, this activity moves stands toward historic species composition and makes them more resilient to disturbances such as wildfire. In the short-term, the increase in fine dead fuels would increase the intensity of wildfires should one occur in this area.

Watershed restoration projects (road obliteration) are also included in this project. The ignition density analysis for the Idaho Panhandle and Newport Ranger District shows that most of the highest ignition densities are in developed areas. Decreasing road density may result in a small decrease in human-caused fires, although the change may not be noticeable because there would not be a significant change in road density or use patterns.

Consistency With the Forest Plan

The goal of the Forest Plan is to provide efficient fire protection and fire use to help accomplish land management objectives. Alternative A excludes fuels treatment, Alternative G treats a larger percentage of the acreage than alternatives B, C, and E. The continued succession of fuels and vegetation, mortality from insect disease, and the exclusion of fire will create areas where the trend in fire behavior characteristics will in time exceed the goals, objectives and standards established in the Forest Plan.

Action alternatives propose prescribed burning and make progress toward reducing the potential intensities and severities of wildfire. Even with this treatment, untreated areas and areas treated with salvage harvest will continue to trend toward characteristics that exceed the goals, objectives and standards established in the Forest Plan.

AIR QUALITY

CHANGES BETWEEN THE DRAFT AND FINAL EIS

This section was revised to improve readability. An analysis of particulate matter production was added, and the cumulative effects analysis was improved.

REGULATORY FRAMEWORK

Current direction to protect and improve air quality on National Forests is provided by 1) the Forest and Rangeland Renewable Resources Act of 1974 (16 U.S.C. 1601), as amended by the National Forest Management Act (16 U.S.C. 1602); 2) the Federal Land Management Policy Act of 1976 (43 U.S.C. 1701); and 3) the Clean Air Act amendments of 1977 and 1990 (42 U.S.C. 7401-7626). The Clean Air Act is administered jointly by the Environmental Protection Agency (EPA) and the states. Three elements of the Clean Air Act generally apply to management activities that produce emissions (1) protection of Ambient Air Quality Standards, (2) conformity with state implementation plans, and (3) protection of visibility in class I airsheds.

The EPA has issued National Ambient Air Quality Standards (NAAQS) for sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter less than or equal to 10 microns (PM_{10}). EPA is in the process of developing NAAQS for particulate matter less than 2.5 microns ($PM_{2.5}$). These small particles (both PM_{10} and $PM_{2.5}$) are not effectively filtered by the human respiratory system, and much of it penetrates deep into the lungs. When inhaled, these small, particles can cause respiratory problems, especially in smoke sensitive portions of the population such as the young, elderly or those predisposed to respiratory ailments. Particulates are the primary pollutant associated with wildland burns.

An area that is found to be in violation of NAAQS is called a non-attainment area. Pollution sources in these areas are subject to tighter restrictions.

Washington State has developed smoke management guidelines for all prescribed burning projects. Any prescribed fire activities that consume more than one hundred tons of fuel within a 24 hour period require approval from the State.

Definitions

Class I - These areas include all international and national parks, greater than 6,000 acres, and national wildernesses greater than 5,000 acres which existed on August 7, 1977, and other areas so designated by EPA. This class provides the most protection to pristine lands by severely limiting the amount of additional man-made air pollution which can be added to these areas.
Class II - These areas include all other areas of the country. These areas may be upgraded to Class I. A greater amount of additional man-made air pollution may be added to these areas. All Forest Service lands which are not designated as Class I are Class II lands.
Class III - These areas have the least amount of regulatory protection from additional air pollution. To date, no Class III areas have been designated anywhere in the country.
NAAQS - National Ambient Air Quality Standards is the level of pollutant above which detrimental effects on human health and welfare could occur. This level is set by EPA.
Non-attainment Area - An area that is found to be in violation of NAAQS. Pollution sources in these areas are subject to tighter restrictions.

AFFECTED ENVIRONMENT

Newport planning area lies on the east side of the Pend Oreille River from near Marshall Lake north to the Browns Creek area. The air quality in this area is generally considered very good although an occasional negative impact has occurred due to smoke from wildfires, debris/waste burning, smoke and dust from agricultural activities, and vehicle exhaust and dust. The prevailing winds are from the west/southwest and normally push smoke from prescribed burning to the northeast and out of the planning area during the spring and fall burning seasons. The method used to determine existing air quality include visual observations and annual reports from the Montana/North Idaho Smoke Management Committee and the State of Washington Department of Natural Resources.

Historically, fire, and therefore smoke, have always been part of the Northern Rockies ecosystem. Fire history would indicate impacts by smoke on an infrequent basis. Fires occurring naturally in the assessment area and the general weather regimes of North Idaho indicate emissions persisting from a few hours to several days. These impacts would have occurred in the summer and early fall months.

The effect of Euro-American settlement and subsequent fire protection has reduced the amount of area burned, under some firefighting conditions, and reduced the duration of smoke emissions from wildland fires. In the case of prescribed fire, the amount of smoke generated has been mitigated from earlier levels of post settlement burning by forest managers scheduling burns for periods during good to excellent dispersion.

The following displays the non-attainment areas in this general area (EPA, 1999). Kootenai County, Idaho which lies about 20 miles to the south has been proposed as a non-attainment area for PM10.

Table III-288. Non-attainment areas for air quality

Location	Distance From Planning Area	Standard
Sandpoint, Idaho	25 miles east	PM10
Spokane, Washington	40 miles south	PM10 and carbon monoxide
Pinehurst, Idaho	60 miles southeast	PM10

The land within the Newport planning area is designated as Class II. The nearest Class I airsheds are the Cabinet Wilderness about 65 miles to the east; the Pasayten Wilderness, about 90 miles to the west; and the Spokane Indian Reservation[1], about 40 miles to the southwest.

ENVIRONMENTAL CONSEQUENCES

Methodology

The primary method used to determine the estimated effects on air quality for the action alternatives is described below:

First Order Fire Effects Model (FOFEM), is a software program designed for resource managers to estimate woody fuel consumption and smoke production for forest stands (USDA 1997d). Emission production modeling was completed for each alternative (see project file). FOFEM model emission production, not visibility or dispersion. Categories of emissions estimated are PM 2.5 (particulate matter less than 2.5 microns in diameter), and PM 10 (particulate matter less than 10 microns is diameter). The program is national in scope, vegetation independent, and requires few weather and fuel inputs. Appropriate for long range

[1] *The Spokane Indian Reservation was designated a Class I airshed by EPA, at the request of the tribe. The visibility protection of subpart 2 of the Clean Air Act does not apply to this area. Source: Eastside Draft EIS Appendix 1-2 page 78.*

planning, FOFEM predicts woody fuel consumption which directly relates to the production of particular matter.

Disposal of slash from harvesting through the use of prescribed fire can temporarily affect air quality. Accumulation of slash impedes the establishment of natural or artificial regeneration. Slash and heavy fuel loading also increases the risk of wildfire. Prescribed fire is often used as a tool to reduce fuel loadings thereby reducing the risk of wildfire.

The Colville National Forest's Newport Ranger District follows the Washington State Smoke Management Guidelines for all prescribed burning projects. Requests to burn are made the previous day, through the appropriate Forest Dispatch Center, to the Washington State Department of Natural Resources in Olympia, WA, who administer the smoke management program. The procedures used by the Washington State Department of Natural Resources are considered to be the best available control technology (BACT), by the state of Washington. Approval or denial to burn based on weather and atmospheric conditions is sent to the Forest dispatch office the following morning. The WDNR Smoke Management Program considers proximity to Class I airsheds, non-attainment areas and weather factors that may cause an intrusion into these areas. Based on the area/unit descriptions sent to the WDNR from the districts fire and fuels organization, a determination would be made as to how much or which units can safely be burned and stay below NAAQS thresholds of PM10 production.

Historically, prescribed burning on the Newport Ranger Districts occurs in the spring and fall seasons over a time span of 45 to 60 days in each season. All burning would comply with federal and state regulations. Management practices include, but are not limited to, burning under spring like conditions (high fuel, soil and duff moistures) to reduce emissions and provide for retention of large woody debris, evaluation of atmospheric stability to validate predictions of windflow and smoke dispersal, and public contact and education. It should also be noted that control of the burning prescription during a spring or fall burn would generate less smoke than a much hotter stand replacing summertime wildfire as much of the fuel would have been removed by harvest operations.

Direct and Indirect Effects

Alternative A

Alternative A is the No Action alternative; there would be no change from current management direction. This alternative would have no immediate adverse effect on air quality. Current management activities in this area contribute little additional pollutants to the local airsheds. The primary sources of pollution would be smoke from other projects both on National Forest and private lands, vehicular exhaust, and dust from motor traffic in the area.

Cumulative Effects

The potential for air quality degradation and reduced visibility increases with this alternative. Existing and increased mortality in the Newport planning area increases the risk of large stand-replacing wildfires. Consumption of increased fuel loads and understory biomass would increase the amount of smoke emissions. These emissions may remain in the local and surrounding airsheds for a period of a few days to several weeks depending on the fire's size and intensity.

Effects Common to All Action Alternatives

Direct and Indirect Effects

The risk of smoke intrusion into Class I airsheds from any prescribed burning operations in the planning area would be very minimal due to distance and prevailing winds. Smoke created in the Newport planning area is normally carried to the northeast by the prevailing southwest flows aloft and would not normally affect Class I airsheds. Smoke from the project area may temporarily affect Sandpoint but not normally affect Spokane, or Pinehurst because of the direction of the prevailing winds.

Dust that escapes the local area and mixes with the general atmosphere generated from road reconstruction, and increased vehicle traffic may temporarily affect air quality. The contract would require dust abatement during dry periods when dust from road travel becomes a problem.

All action alternatives include underburning. Results of the FOFEM emissions modeling determined annual PM2.5 and PM10 standards would not be exceeded for each alternative. These results are based on completing approximately 20% of burning annually by alternative. However, in alternative A, no fuels treatments would be completed. As a consequence, these standards may be exceeded in the event of a wildfire. Treating fuels reduces the intensity and severity, should a fire occur. Fuels treatments for action alternatives, are scheduled to be completed within five years after harvest operations.

Table III-289. Summary of fuel treatment and fire emissions (FOFEM), Newport planning area.

Fuel Treatment	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Fuel Treatment (acres)							
Underburn	0	896	896	3,269	896	2,443	2,736
Lop and Scatter	0	625	625	1,493	625	941	0
Total Treatment Acres	0	1,521	1,521	4,762	1,521	3,384	2,736
Emissions from burning							
PM10 emissions (lbs/acre)	0	102	102	102	102	102	102
Total tons of PM10	0	46	46	167	46-	125	140
PM2.5 emissions (lbs/acre)	0	86	86	86	86	86	86
Total tons PM2.5	0	39	39	141	39	105	118

None of the opportunities identified in the Newport planning area (timber stand improvement, watershed restoration) would have any impact on air quality.

Cumulative Effects

Smoke produced from fuel treatments would compete with other activities within the airsheds. Activities such as agricultural field burning, other forest residue burning, residential wood stove use, motor vehicle produced exhaust and dust, and even dust from the Columbia basin all produce pollutants that contribute to degradation of air quality. The monitoring of air pollutants during prescribed burning seasons is used to eliminate burning during times when such activities would result in violations of the State standards, including unacceptable impacts to non-attainment areas. The Forest Service voluntarily ceases burning operations to avoid violations of State standards. The monitoring of air pollutants during prescribed burning periods have not recorded any violations of the State standards to date. Burning of activity-created fuels would occur primarily in early spring when demand for airspace has been historically low. Smoke and particulate matter flows to the northeast and dissipate rapidly during good to excellent dispersion days.

Because the Forest Service limits the number of acres burned on one day, or ceases burning altogether in order to meet the Clean Air Act, the cumulative effect of all the alternatives when combined with other burning projects on the Newport Ranger District would probably be to extend the number of days when burning would occur. In general, the more acres to be burned would translate into more days of burning.

Effects of Opportunities

Timber stand improvement projects (pre-commercial thinning and pruning) and **watershed restoration** projects (road obliteration) would have no effect on air quality.

Consistency with the Forest Plan and Other Applicable Regulatory Direction

The Colville Forest Plan places no special requirements beyond those required through the Clean Air Act. The project meets the Clean Air Act through coordination with the State prior to burning, and the use of burning techniques that minimize smoke emissions. Burning plans describing how and under what conditions the burning would take place are prepared by qualified personnel. Prescribed burning is consistent with State laws requiring treatment of activity created fuels to reduce the effects of catastrophic forest fires.

WILDLIFE

CHANGES BETWEEN THE DRAFT AND FINAL EIS

This section was revised to better reflect the standards and requirements of the Colville National Forest Plan.

REGULATORY FRAMEWORK

The regulatory framework providing direction for the protection and management of wildlife habitat comes from the following principle sources:

- *The Endangered Species Act of 1973 as amended (ESA),*
- *The National Forest Management Act of 1976 (NFMA), and*
- *The Forest Plan for the Colville National Forest, as amended by the Regional Forester's Amendments 1 and 2.*

Section 7 of the ESA directs Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any Threatened or Endangered species or result in the destruction or adverse modification of their critical habitat.

NFMA provides for balanced consideration of all resources. It requires the Forest Service to plan for diversity of plant and animal communities. Under its regulations the Forest Service is to maintain viable populations of existing and desired species, and to maintain and improve habitat of management indicator species.

The Forest Plan, in compliance with NFMA, establishes Forest wide management direction, goals, objectives, standards and guidelines for the management and protection of wildlife habitat and species, including: old-growth habitat, management indicator species, sensitive species, and Threatened and Endangered species. The Regional Forester's amendments included some additional standards for snags, down wood, and goshawks.

Direction concerning implementation of the ESA and NFMA can be found in Forest Service Manuals (FSM) and various letters/memos from the Washington Office, the Regional Office and the Supervisor's Office.

AFFECTED ENVIRONMENT

There are 62 suspected and/or documented mammal species in the analysis area. Six of these species are dependent on riparian habitats and one is dependent on cliffs or rim habitats.

There are 220 suspected and documented bird species in the analysis area. Sixty-two are dependent upon specific habitats as follows: 1 bird species is dependent on early successional stages; 2 bird species are dependent on middle successional stages; 2 bird species are dependent on late successional stages; 15 bird species are dependent on riparian habitats; 33 bird species are dependent on snag habitat; 3 bird species are dependent on down woody habitats; 5 bird species are dependent on cliff and rim habitats; 1 bird species is dependent on cave and burrow habitats;

There are 17 suspected and documented reptile and amphibian species in the analysis area. Three of these species are dependent on riparian habitats.

The following table displays the species of concern in the analysis area, and their relative abundance.

Table III-290. Species of concern and relative abundance, Newport planning area.

Species	Relative abundance
Grizzly bear (*Ursus horribilis*)	Low
Gray wolf (*Canis lupus*)	Low
Canada lynx (*Lynx canadensis*)	Low
Pine marten (*Martes americana*)	Low
Rocky mountain elk (*Cervus canadensis*)	Low to moderate
Blue grouse (*Dendragapus obscurus*)	Moderate to high
Goshawk (*Accipiter gentilis*)	Low

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES FOR SPECIFIC SPECIES

The following section is a brief description of the affected environment and environmental consequences for Threatened, and Endangered species under the Endangered Species Act, and for the Management Indicator Species in the Colville Forest Plan. For Threatened and Endangered Species a 'determination' is shown. This is the determination presented to the U.S. Fish and Wildlife Service for their concurrence. For Forest Plan Management Indicator Species, the conclusions discuss whether the alternatives meet Forest Plan standards and guidelines (Forest Plan pages 4-38 through 4-43). Past, ongoing and reasonably foreseeable activities have been taken into account in the analysis of the current condition. Reasonably foreseeable activities are listed in Appendix E and include approximately 3,000 acres of salvage and commercial thinning along with a small amount of road construction and reconstruction. Methodology varies somewhat for each species. The wildlife section of the project file includes information about how each analysis was done. Structural stage and Historic Range of Variability (HRV) analysis were presented previously in the Vegetation section. For specific details about each treatment unit and road project, refer to Appendix D.

Grizzly Bear

The grizzly bear is **Federally listed as a Threatened Species** under the Endangered Species Act. There is a Grizzly Bear Recovery Area 11 miles to the north of the analysis area. Grizzly bears have not been confirmed in this area in many years. Reports of grizzly bears have occurred around the analysis area in the past but not within the area. A grizzly bear was killed west of the analysis area in 1998 along the Pend Oreille River. It was a young male, likely traveling to find a home range. Reports have come from the north and east on the Newport and Sullivan Lake Districts of the Colville NF and the Priest Lake District of the Panhandle NF. Historic reports do not confirm or deny the existence of the bear in this area. Suitable habitat is present, although limited by high road densities. The divide between the Newport and Priest Lake Districts would provide a high elevation travel corridor to Canada from the analysis area. Grizzly bears are thought to be infrequently transitory on the Newport District.

Direct and Indirect Effects of the Alternatives

Alternative A: This alternative would not harvest any timber or build any roads. Potential grizzly bear habitat would be maintained in the current condition in the short term (10 to 20 years). There is potential for the dead Douglas-fir trees to fall may cause travel problems for bears in some areas. The "jackstraw" areas may be a barrier but travel should still be possible.

Alternatives B, C, D, E, F and G: All six action alternatives would maintain potential grizzly bear habitat. The commercial harvest and prescribed burning would reduce stocking and remove some future "jackstrawed" areas.

Cumulative Effects

Within the Newport Analysis Area, other ongoing or reasonably foreseeable activities which would have an impact on grizzly bear potential habitat have been included in the determination of the total amount of habitat which is currently suitable. Activities such as timber harvest and road construction on lands managed by other ownerships could reduce the amount of suitable habitat. The reduction in road densities coupled with increased closure effectiveness would result in an overall increase in suitable habitat. The cumulative impacts on potential grizzly bear habitat within the Newport analysis area resulting from the addition of effects of this project with proposed and past activities would be low. The cumulative impacts resulting from high road densities would be somewhat reduced as a result of road obliteration and gating associated with implementation of the proposed alternatives.

Determination: The action alternatives **may affect, but will not adversely affect** grizzly bear populations or their habitats.

Gray wolf

The gray wolf is **Federally listed as an Endangered Species** under the Endangered Species Act. Reports of gray wolves have occurred in and around the analysis area (Hansen, 1986). There have been sightings by local residents, but these reports have not been confirmed sightings by biologists. Scat and tracks, and some vocalizations have been reported by Forest Service and US Fish and Wildlife Service personnel. A dead wolf was discovered approximately 6 miles to the west of the analysis area. The USFWS and WDFW could not determine the cause of death. This animal was a 4 year old female from the Nine Mile Pack in Montana.

It is difficult to determine a trend for wolf populations in the area. It is thought that the animals are transient and are not reproducing in the Pend Oreille River Valley. There are no known dens in or around the area.

By maintaining deer and elk populations and starting to reduce currently high open road densities, individual wolves and suitable habitat would benefit.

Direct and Indirect Effects of the Alternatives

Alternative A: This alternative would not harvest any timber or build any roads. Potential wolf habitat would be maintained in the current condition in the short term (10 to 20 years). In the long term, potential habitat would have increasing stocking levels of conifer trees. These overstocked stands of trees could become unsuitable for the wolf as they become too dense for the wolf to use. Hiding cover is needed by the wolf but if the stand is too dense it may be avoided as potential cover or foraging areas.

Alternatives B, C, D, E, F and G: All six action alternatives would maintain or improve wolf prey base and increase security through road closure. The commercial harvest and prescribed burning would reduce stocking and remove some future/potential "jackstrawed" areas.

Deer and elk habitat would be managed differently in each action alternative. This would have an effect on potential wolf population and habitats.

Cumulative Effects

Within the Newport Analysis Area, other ongoing or reasonably foreseeable activities which would have an impact on wolf potential habitat have been included in the determination of the total amount of habitat which is currently suitable. Activities such as timber harvest and road construction on lands managed by

other ownerships could reduce the amount of suitable habitat. The reduction in road densities coupled with increased closure effectiveness would result in an overall increase in security. The cumulative impacts on wolves within the Newport analysis area resulting from the addition of effects of this project with proposed and past activities would be low. The cumulative impacts resulting from high road densities would be reduced to a minor degree as a result of road obliteration and gating associated with implementation of the proposed alternatives.

Determination: The action alternatives **may affect, but will not adversely affect** wolf populations or their habitats.

Bald eagles

The bald eagle is **Federally listed as a Threatened Species** under the Endangered Species Act. Bald eagles utilize the Pend Oreille River as their main habitat for nesting and foraging. They have been observed at lakes in the analysis area and along the limited National Forest Lands along the river bank. Eagles do use Bead Lake during some winter months for foraging. There are no nests or communal roost trees along Bead Lake, although the eagles do use the abundant snags around the lake to perch while they forage. According to the WDFW, nesting eagle pairs have increased slightly in the past 10 years along the Pend Oreille River corridor between Idaho and Canada. There are no active nesting sites in the analysis area. There are no recommendations to improve bald eagle habitat (USDI, 1979).

Direct and Indirect Effects of the Alternatives

There are no direct effects to bald eagles in any of the alternatives. The project does not alter habitat along the Pend Oreille River corridor nor in the perch areas around Bead Lake. Bald eagles in the area utilize carrion during the winter and spring month. Elk and deer mortality is not expected to increase because of the project, therefore there should not be a noticeable indirect effect to bald eagles.

Cumulative Effects

No cumulative effects are expected from the project because eagles are not known to utilize the analysis area, the project is not adjacent to known nests or roost areas, and the project is not expected to change foraging conditions for the eagle.

Determination: All alternatives would have **no effect** on bald eagle populations or their habitat.

Peregrine Falcon

The peregrine falcon is **Federally listed as and Endangered Species** under the Endangered Species Act. Falcon sightings have been confined to an area around "River Bend". Biologists from Eastern Washington University, the Kalispel Tribe of Indians, and the Newport Ranger District have reported the falcon along the banks of the Pend Oreille River. There is not enough data available to determine current or past populations, or current trends in the population.

Falcons use ledges on high cliffs for nesting locations. Waterfowl and other birds are the main prey species for the falcon. Prey species are abundant along the Pend Oreille River corridor.

Suitable nest locations were surveyed in 1997 within and adjacent to the analysis area. No nest sites were found. Potential nest sites were marginally suitable.

There are no recommendations to improve peregrine falcon habitat.

Direct and Indirect Effects of the Alternatives

There are no effects to peregrine falcons in any of the alternatives. Habitat is marginally suitable and would not be altered by any of the activities. Prey species and their habitats should not be changed by the project. The project does not occur along the Pend Oreille River corridor.

Cumulative Effects

No cumulative effects are expected from the project because habitat, including nest sites, is marginally suitable, and this project, along with past and foreseeable activities, is not expected to change foraging conditions or have a negative impact on potential nest sites.

Determination: All alternatives would have **no effect** on peregrine falcon populations or their habitat.

Canada lynx

Lynx is a **sensitive species for the Forest Service in Region 6**, and has been proposed by the U.S. Fish and Wildlife Service for listing. Lynx occur primarily in the boreal, sub-boreal and western montane forests of North America. In the western U.S. lynx typically use spruce/fir, Douglas-fir, and fir-hemlock vegetation types dominated by lodgepole pine, Engelmann spruce, subalpine fir, aspen, and whitebark pine at 1,400 - 2,700 meters elevation. The primary prey for lynx is the snowshoe hare. Snowshoe hare are found in dense forest types on the Newport District, including lodgepole pine, cedar-hemlock, and mixed conifer forests. Denning habitat has a common component of large woody debris, either down logs or root wads. Stand structure appears to be of more importance than forest cover type. Lynx seem to prefer to move through continuous forest, and particularly use ridges, saddle, and riparian areas (Koehler, 1987 and 1988). Field reconnaissance of the planning area in the winter by the district wildlife biologist indicate that stands of trees with more stems per acre than 6,000 are too dense to be used by prey and are not suitable for lynx. Forage habitat for lynx relates directly with forage habitat for snowshoe hare. This type of habitat is found in 10 to 30 year old regeneration harvest units. When the trees reach a height of 8 feet or more they are usable during the winter by the snowshoe hare. When stands are older than 30 years old and the trees become too tall and tightly spaced if not thinned, then the stand is no longer usable by snowshoe hare.

Lynx habitat was determined to be above 3,000 foot elevation for the analysis area. This is based upon local knowledge of the area by the Newport and Priest Lake Ranger District's Wildlife Biologists. There are 33,079 acres of suitable lynx habitat. Denning habitat is 4.9% or 1,632 acres of the total lynx habitat. Forage habitat is 15.2% or 5,018 acres. Travel habitat is 73.3% or 24,242 acres. Preforage habitat is 6.6% or 2,187 acres.

Direct and Indirect Effects of the Alternatives

Travel habitat would not change due to logging or burning activities; these areas would still maintain 35 to 60% crown closure which is suitable for travel and security. Some logging activities in denning habitat are proposed in Alternative D. Short-term effects in denning habitat may be a one to five year avoidance of the area by lynx. Long-term denning habitat suitability is not expected to be negatively impacted, since the trees removed would be dead and are no longer contributing to canopy closure. Sufficient amounts of down, woody material would be preserved. Denning habitat would remain at current levels for all alternatives. The created snags in these denning areas would provide future down woody debris needed by the female and her young. This project would not change the percent of suitable habitats for lynx. Salvage logging would be the method used in lynx habitat, therefore green trees would remain to provide habitat components for lynx. Some disturbance during logging and prescribed burning may change lynx movement in the area; this would be a short-term effect. The Bear Paw road (approximately 4 miles) would have a gate installed to ensure a winter closure to motorized vehicles after the project is completed. There would be no increase in groomed snowmobile routes through the lynx analysis area. The open winter road density is 0.7 miles/square mile.

The road closure would restrict motorized vehicles in an area that is not groomed but is used by snowmobiles in the winter.

Percentages of habitat components would not change with any alternative. The beetle-killed trees would not change the structural or security habitat components within lynx habitat. The Bear Paw road would be closed for all alternatives.

Cumulative Effects

Within the Newport Analysis Area, other ongoing or reasonably foreseeable activities which would have an impact on lynx have been included in the determination of the total amount of habitat which is currently suitable either as foraging habitat, denning habitat or as temporarily non-suitable for lynx. Activities such as timber harvest and road construction on lands managed by other ownerships would reduce the amount of suitable habitat. The reduction in road densities coupled with increased closure effectiveness would result in an overall increase in security for lynx. The cumulative impacts on lynx habitat within the Newport analysis area resulting from proposed activities would be low. The cumulative impacts resulting from access provided by high road densities and winter recreation would be somewhat reduced as a result of proposed road closure.

Determination: The action alternatives ***are not likely to jeopardize the continued existence of*** Canada lynx populations or their habitats.

Pine Marten

Pine marten are a **Management Indicator Species** in Colville Forest Plan. Pine marten populations have fluctuated over the past 60 to 100 years. A 1932 Game Report by the Forest Service indicates a high density of marten in the Kaniksu and Pend Oreille areas as compared to nearby National Forests in Idaho and Montana. These reports reflect information from Washington Department of Fish and Wildlife (WDFW) Area Biologist Steve Zender. He reports that marten populations in northeastern Washington were high before the fires in the 1930s and that there was high trapping pressure in the 1940s and 1950s. Current populations are low and animals are scattered over large areas. Marten have been seen in the analysis area at higher elevations. Tracks and scat have been found at lower elevations of this area.

Current pine marten habitat is limited because of existing clearcut areas. Marten will avoid openings in the forest that have less than 40% crown closure. Forest conversion to agricultural land has also reduced the amount of suitable habitat in the lower elevations on private land.

The Newport analysis area contains 17 Forest Plan designated pine marten areas. The units are at least 160 acres in size. These areas are located approximately 2.5 miles apart and are intended to serve as denning areas for female marten. These habitat types require at least a 40% crown closure, abundant large snags and down woody material, and large coniferous live trees.

Pine marten habitat can be improved by increasing the size of the overstory trees. This would provide the needed crown closure that is required for security cover. Snag sizes would increase in the long term with increased sizes in the coniferous trees as the larger trees die and become snags.

Direct and Indirect Effects of the Alternatives

Table III-291. Units within or partially within pine marten areas, Newport Analysis area

	Alternatives				
	A	B, C, & E	D	F	G
Unit numbers	23a, 24a, 30, 37, 39, 40, 45, 48	30, 37, 39, 40, 45, 48	23a, 24a, 30, 37, 39, 40, 45, 48	23, 24a, 30, 37, 39, 45	23, 24a, 37, 45
Total Acres	315	185	315	300	180

Alternative A would have all snags retained and this would likely exceed needed snags and down woody debris for female marten denning needs.

Alternative B, C, D, E, F, G: Timber harvest (Alternatives B, C, D, E and F) or burn units (Alternative G) are located in some areas of pine marten units in these action alternatives. Harvest units may or may not lie entirely within a pine marten unit. Treatments would maintain canopy cover and hiding cover (35-60% crown closure) throughout the units. The large-sized green trees that would be retained should increase in diameter faster with the decreased competition for nutrients and water. The size of these snags is expected to be larger as the green trees are allowed to grow. Numbers of snags in each decomposition class would be similar in the short term; this is not preferred but is unavoidable if the areas are to be managed for large green trees.

Existing snags levels may decrease because of safety concerns during the logging operations but 4 to 6 newly created snags (by the Douglas-fir beetle) would be retained. Riparian zones and leave strips would maintain some of the existing snags. It is difficult to estimate the snag densities for post harvest and post burn conditions, but they would be decreased. While the timber harvest prescriptions (Alternatives B,C, D, E and F) or burn unit prescriptions (Alternative G) would improve future tree size and may reduce fire risk in the long term, the loss of snags, both in size classes and decomposition classes, would negatively affect pine marten habitat in the short term. Therefore, as an alternative harvests more acres in pine marten units there would be an increased negative short-term effect of snag density reduction. Alternative D would have the greatest short-term negative effect on the pine marten units, while Alternative G would have the least short-term negative effect.

Felled snags and existing down woody material would be retained in the harvest units. Snags would be retained in sufficient numbers to support a female, denning pine marten. Snags would be created as green trees die and tops break off.

Cumulative Effects

Within the Newport Analysis Area, other ongoing or reasonably foreseeable activities which would have an impact on pine marten have been included in the determination of the total amount of habitat which is currently suitable. Activities such as timber harvest and road construction on lands managed by other ownerships could reduce the amount of suitable habitat. Beetle-caused mortality is expected to decrease canopy closure in stands that have a high proportion of large Douglas-fir. None of the alternatives in this project decrease canopy closure in pine marten areas.

The reduction in road densities coupled with increased closure effectiveness would result in an overall increase in security for pine marten. The cumulative impacts on pine marten habitat within the Newport analysis area resulting from proposed and past activities would be low. The cumulative impacts resulting from access provided from high road densities and winter recreation would be reduced as a result of project design criteria associated with implementation of the proposed alternatives.

Conclusion

All alternatives would meet the Forest Plan standards and guidelines for pine marten.

Elk and Deer

Deer and Elk (big game) are **Management Indicator Species** in the Colville Forest Plan. Elk are to be emphasized in this analysis area. The Forest Plan designated winter range (management areas 6 and 8) and included specific standards and guidelines for cover:forage ratios (50:50) and wintertime open road density (less than 0.4 miles per square mile).

WDFW biologist Steve Zender estimates elk were introduced to the Pend Oreille Valley in 1913 from a source in Spokane which may have been an old zoo or something like a zoo. Populations grew in the 1950s into the 1960s and may have declined since then. This is attributed to the fires of the 1930s and the growth of forage in the form of shrubs that followed the fires. A "Summary of Annual Game Reports, Region One National Forests, 1932" shows elk in the Pend Oreille area at a low number. Elk populations are currently low in the analysis area and they are spread thinly although some hunters are successful in tagging a bull every year.

According to the WDFW, mule deer populations were moderate at the beginning of this century and whitetail deer populations were low. Currently those populations trends have reversed. Mule deer populations have been declining and whitetail deer populations have been increasing. Hunting pressure and habitat changes are thought to be major causes for that trend. In a 1936 Kaniksu Fish and Game winter study report the winter of 1935-36 showed a 62% whitetail and 38% mule deer composition and in the winter of 1936-37 the ratio was 74% whitetail and 26% mule deer. These surveys were informal and reflect only the deer seen by walkthrough field survey people during random routes. The report also states evidence of the deer using different areas each winter. It is believed that this trend continues in current times. Buck to doe ratios were reported as good in the 1930s, 25 to 30 bucks per 100 does. Todays estimates are lower, perhaps 10 to 20 bucks per 100 does. The fawn to doe ratio was also reported as good in the 1930s, 68 to 89 fawns per 100 does. Once again the WDFW estimates todays ratio is low, maybe as low as 30 fawns per 100 does. The probable cause of low fawn numbers is predation from black bears and cougars along with the loss and reduction in quality of fawning habitat in riparian zones.

Pellet group counts show 19.8 deer use days per acre in the Bearpaw/Mystic Lake area. Pellet group counts show 13.4 elk use days per acre in the Bearpaw/Mystic Lake area. Pellet group counts show 14.4 deer use days/acre in the Moon Hill area. Pellet group counts show 3.3 elk use days per acre in the Moon Hill area. Pellet group counts show 26.8 deer use days per acre in the Skookum Peak area. Pellet group counts show 0.1 elk use days per acre in the Skookum Peak area. The counts were taken in winter range areas. Deer or elk use days per acre refers to the amount of time a deer or elk may have used the acre or area, it may have been one deer using the acre for 19.8 days or 19.8 deer using it for 1 day, if it is read literally. It can also be looked at as a reference number, a number between 10 and 15 days for deer is average over the district and a number between 3 and 7 is average for elk over the district.

The area contains 2 main herd units for the elk winter range, the Skookum and Bead Herd Units.

The Skookum Herd Unit is about 3,217 acres (NFS lands) with a 51:49 cover:forage ratio. There are 15.0 miles of road in the herd unit, 6.33 are closed with a barrier of some kind, and 8.65 miles are open in the winter. This equates to an open road density of 2.83 miles per square mile in the winter (this area fails to meet the Forest Plan Standards and Guidelines for wintertime open road density).

The Bead Herd Unit is about 2,446 acres (NFS lands) with a 62:38 cover:forage ratio. There are 14.7 miles of open road in the herd unit. 12.0 miles are closed with a seasonal closure sign, December 1 until March 31. These signs are only marginally effective at providing winter security. This would equate to an open road

density of 2.71 miles per square mile in the winter, and a summer open road density of 3.9 miles per square mile. This area fails to meet the Forest Plan Standards and Guidelines for wintertime open road density.

The forage quality varies across the areas from poor to good and from being available (reachable) to not available. Forage species present include redstem ceanothus, serviceberry, prunus spp, rose spp, Douglas maple, Oregon grape, fescues etc.

Thermal cover and snow intercept thermal cover is moderately available over the herd units. There are many places where the cover is not used by elk and deer as snow intercept cover but will provide limited thermal and hiding cover as they travel between forage areas and usable cover areas.

Condition of the Forage

Based on random surveys over the winter range, the following information was gathered.
The **redstem ceanothus** has 48% leader use, 4% as seedlings, 25% as young plants, 65% as mature plants, and 6% as decadent, 7% is available with little hedging, 18% is moderately hedged, 60% is available severely hedged, and 15% is unavailable. This species has high densities in a few locations in the analysis area, and is scattered over most of the area.
The **Oregon grape** has 10.75% leader use, 34% as seedlings, 22% as young plants, 43% as mature plants, & 1% decadent, 72% is available little hedging, 17% is available moderately hedged, 2% is available severely hedged, and 9% is unavailable. This species is scattered over the analysis area and is well represented in the plant composition.
The **serviceberry** has 22.1% leader use, 4% as seedlings, 31% as young plants, 63% as mature plants, & 2% as decadent, 35% is available little hedging, 27% is available moderately hedged, 26% available severely hedged, 3% is unavailable little hedging, 9% is unavailable and severely hedged. This species is not a major plant species in the area, but is a very palatable forage. The plant grows in small patches scattered widely over the analysis area.
The **Douglas maple** has 6.1% leader use, 29% as seedlings, 42% as young plants, 28% as mature plants, 61% is available little hedging, 32% is available with moderate hedging, 2% is available severely edged, 2% is unavailable little hedging, 2% is unavailable moderately hedged. This species grows singly and is scattered over the analysis area.
The **rose species** have 20% leader use, 8% are seedlings, 32% are young plants, 57% are mature plants, 3% are decadent, 39% are available little hedging, 36% are available moderately hedged, 25% are available severely hedged. There are 3 species of rose that grow in the analysis area and are abundant and are easy to find.
Leaders are the last years stem growth, the portion of the plant that is desirable as forage. Hedging is the amount of foraging on the leader by the deer or elk. Available forage would be six feet in height or less.

Elk and deer habitat can be improved by returning coniferous forests to a desired mix of cover and forage. Larger tree sizes in the seral species will provide improved cover. Removal of the shade tolerant tree species such as grand fir would allow sunlight to reach the ground and increase the growth of desired forage species such as serviceberry and redstem ceanothus. Prescribed burning can also be used to stimulate new growth and regrowth of desirable forage species.

Direct and Indirect Effects of the Alternatives

The following table displays the expected cover:forage ratios and wintertime open road density for each alternative. A list of the units in each herd unit that are expected to impact cover:forage ratios are located in the project file.

Table III-292. Cover:forage ratio and wintertime open road density, Newport Herd Units.

	Before Beetle Out-break	Alt. A	Alt. B, C and E	Alt. D	Alt. F	Alt. G
Skookum Herd Unit						
Affected acres in winter range	NA	709	337	709	297	337
Cover:forage ratio	51:49	43:57	43:57	43:57	43:57	43:57
Wintertime open road density	2.83	2.83	2.46	2.46	2.83	2.46
Bead Herd Unit						
Effected acres in winter range	NA	1,654	331	1,654	1,654	1,654
Cover:forage ratio	62:38	62:38	62:38	62:38	62:38	62:38
Wintertime open road density	2.71	2.71	2.46	2.46	2.83	2.46

Alternative A: There would be no harvesting or road construction in this alternative. There would also be no reduction of open road densities. The insect caused loss of green trees in these areas, or units, would decrease the effectiveness of the cover component in winter range.

Effects of alternatives B, C, D, E, and F: All harvest units in elk winter range would have salvage logging only; no green tree removal for silvicultural reasons would be harvested. Some incidental green tree removal is expected in skid trails and skyline corridors and for safety. Underburning prescriptions would have a target mortality of less than 10% written into the objectives for the burn.

Additional cover would be retained in units 25a and 26a (approximately 700 in winter range). Seven unlogged and unburned clumps of cover would be retained in at least 30 acre blocks. These blocks would be well distributed over the entire area. North aspects and small basins would work well for cover habitat and would be preferred over southern slopes. Crown closure would be over 50%, with 70% preferred.

Additional cover would be retained in unit 34a (approximately 292 in winter range). Three unlogged and unburned clumps of cover would be retained in at least 30 acre blocks. These blocks would be well distributed over the entire area. North aspects and small basins would work well for cover habitat and would be preferred over southern slopes. Crown closure would be over 50%, with 70% preferred.

All units would be evaluated after harvest for consideration for prescribed fire. If the unit is suitable for burning, forage stimulation would be given high priority.

Effects of alternative G: Effects of alternative G would be similar to alternative D, but would use prescribed burning only to treat stands in the drier habitat types. Burning should stimulate production of desired forage species, but would be more difficult to retain target canopy closures. There is a chance that cover:forage ratios would not meet the Forest Plan.

Cumulative Effects

The beetles would reduce crown closure in both herd units in all alternatives, including No Action. The Skookum Herd Unit is projected to have cover below that recommended in the Forest Plan, due to the beetle outbreak. None of the harvest alternatives bring the cover any lower. Alternative G may reduce cover below Plan standards. The Bead herd unit is projected to have forage higher than that recommended in the Forest Plan. This project is not expected to change the cover:forage ratio in this herd unit. For all alternatives except G, the amount of cover would be suitable for elk winter range. With salvage-only prescriptions for logging, all harvest alternatives would maintain the cover component as it is predicted after the beetles have impacted the forest. None of the management actions, including the current and reasonably foreseeable, would change cover:forage ratios from the current condition with the possible exception of Alternative G.

Both herd units currently have a wintertime open road density higher than that recommended in the plan. None of the alternatives increase the wintertime open road density. Alternatives B through G reduce wintertime open road density. Because of the high amount of private and cost-share roads in the analysis area, it is not possible to reduce the road densities to Forest Plan standards via this project.

Woodpeckers

Woodpeckers and pileated woodpeckers are **Management Indicator Species** in the Forest Plan. There are abundant snags per acre in the unharvested areas. Sampling for previous projects within the analysis area estimated the following snag densities: The Moon Hill area has about 37 snags per acre on the average, with 12% of those in the 20-inches and greater size class and 29% utilized for forage. The Bearpaw/Mystic Lake area has about 18 snags per acre on the average, with 14.5% in the 20-inches and greater size class and 33% utilization for forage. The Skookum Peak area has about 27 snags per acre on the average, with 10% of those in the 20-inches and greater size class and 66% utilized for forage. About 90% of the cavities were in the 20-inches and greater size class snags, but only about 5 or 6% of the total snags were used for nesting. Most snags were grand fir and Douglas-fir with all other tree species represented in small amounts. Past harvest units have little if any snags present, only 0 to 3 snags per acre.

Additional analysis for this project, including aerial photography of beetle infestation, revealed many patches of mortality and snags outside proposed treatment units. 512 acres on National Forest System lands within the analysis area would not be treated with this project. Of this, one area is between 50 and 100 acres in size, and 2 areas are between 100 and 200 acres. The project file contains maps used for this analysis.

Population numbers for past and present woodpecker species is unknown.

There is 1 pileated woodpecker Management Requirement Units (PW 10) in the analysis area. The area has suitable habitat for meeting the requirements of nesting pileated woodpeckers. This isolated area along Bead Lake has many large conifer trees, snags, and down logs. The dense overstory provides cover for many species. The unit has not been delineated and would not be delineated until the Douglas-fir beetle has run its course and stabilized. At that time the habitat can be evaluated and the best possible unit can be identified.

Direct and Indirect Effects of the Alternatives

All action alternatives maintain snag levels as required in the Forest Plan, as amended. All alternatives would retain 4 snags per acre in dry forest types and 6 snags per acre in the moist forest types. In all cases, the snags would be designated from the largest d.b.h size class available. These snags would be selected from the recently killed by the beetle or other agents, and these recently killed trees/snags are in addition to the existing snags (pre-beetle infestation).

Alternative A: This alternative would maintain existing snag densities. As existing snags fall and become down woody material, green trees would die and become snags. Existing green trees would provide a mix of snag sizes. The Douglas-fir beetle would create many new snags. If estimates are correct there should be many times the desired numbers for 100% of population potential of pileated woodpeckers, northern three-toed woodpeckers, and primary cavity excavators in general. It is estimated that 5,275 acres of National Forest System land in this analysis area alone would be affected by the beetle, and therefore abundant snags would be available.

Alternatives B, C, D, E, and F: The number of acres to be treated varies by alternative and is displayed in the following table. There would be a mix of conditions when the timber harvest is completed, ranging from 10% to 60% crown closure. Existing snag levels are expected to decrease because of safety requirements of the

Occupational Health and Safety Administration (OSHA) during logging operations. For all alternatives, the mitigation requiring designation of additional snags means that snag densities for woodpecker habitat would be maintained in quantities that would support viable populations of woodpeckers.

Alternative G: This alternative would burn in 2,737 acres of forest. There would be a mix of conditions when the burning is completed ranging from 10% to 60% crown closure. Existing snag levels may decrease because of safety concerns during burning operations. In addition, there is some risk that the burning would create more snags. Snag densities for woodpecker habitat would be maintained in quantities that would support viable populations of woodpeckers.

Table III-293. Acres of proposed treatment units within woodpecker habitat, Newport Analysis area.

	Alternatives				
	A	B, C, & E	D	F	G
Acres	5,275	1,521	4,762	3,384	2,737

Cumulative Effects

Alternative A would maintain the snag densities as they are in the short term. There is a possibility that snag densities and size may decline in the long term. This would be due to overstocking in many stands that would not be able to grow large diameter trees which would be the future snags. While current and reasonably foreseeable management activities on National Forest System lands are designed to minimize current and long-term snag losses, private lands would probably continue to lose snags.

All alternatives would maintain at least the 100% potential population for snag and cavity dependent species in the timber harvest and prescribed burn units. Although the action alternatives appear to have less acres impacted by the project than Alternative A, the acres of beetle killed Douglas-fir forest would be the same in all alternatives. The action alternatives would have different impacts. Potential snags would be removed during logging operations. These dead and dying trees would have provided some habitat for woodpeckers, both nesting and forage. Therefore, as the acres of harvested forest increase, the acres of some lost snag habitat increases, i.e.Alternatives B, C, and E (1,521 acres) have the least impact and Alternative D (4,762 acres) has the most impact. These impacts include lost snags and green trees due to logging and burning operations. Because of the design criteria and mitigation, all alternatives maintain sufficient snags to meet 100% potential population and therefore meet the Forest Plan as amended.

Blue Grouse

Blue grouse is a **management indicator species** in the Forest Plan. Grouse populations seem to fluctuate with the spring weather. Rainy springs kill many young chicks. Blue grouse and ruffed grouse are not uncommon in the analysis area. Franklin's grouse have not been recently reported.

Blue grouse use ridges with large, limby trees such as Douglas-fir and ponderosa pine. These areas have open canopies and are park like. Ruffed grouse have been linked to aspen stands but are not dependent upon them for forage or reproductive areas. Ruffed grouse are found in many areas with low growing shrubs and abundant hiding cover.

In the Forest Plan, projects must maintain or create some specific components of blue grouse habitat -- specifically, in open park-like stands on or near ridges, maintain at least 8 large limby Douglas-fir trees per acre.

Direct and Indirect Effects of the Alternatives

Specific units numbers are listed in the project files. The following table displays the acres of blue grouse habitat to be impacted. Alternative A are the acres being impacted by the beetle infestation that are not proposed for treatment. These areas would be impacted by beetles in the action alternatives as well.

Table III-294. Acres of treatment units in blue grouse habitat.

	Alternatives				
	A	B, C, & E	D	F	G
Acres of blue grouse habitat	602	300	602	245	199

With the Douglas-fir beetle killing the trees that are key for blue grouse, all alternatives would probably reflect some decline in blue grouse habitat. Under the action alternatives, additional green trees may be felled during logging operations and killed during prescribed burning. With the design criteria, this additional loss would be minimized whenever possible.

Cumulative Effects

While current and reasonably foreseeable management activities on National Forest System lands are designed to minimize current and long-term losses suitable habitat, private lands may continue to remove large Douglas-fir. Blue grouse habitat would be maintained on all harvest units where the habitat components exist after the beetles kill the Douglas-fir. Large green trees along the ridges would be left whenever possible after logging operations and prescribed fire activities. All action alternatives in this project meet the intent of the Forest Plan and cumulatively do not cause loss of habitat that would exceed Forest Plan standards.

Great blue heron, beaver, and waterfowl

Duck and geese populations in the United States fluctuate greatly and are influenced by habitat loss and restoration. The analysis area has a variety of waterfowl habitats. Lakes and beaver ponds are the major use areas in the uplands and the Pend Oreille River attracts hundreds of migratory birds. Nesting along the river is variable because of the water level fluctuation due to the dams on the river. Nesting along lakes and beaver ponds is restricted by the limited amount of suitable habitat. Water levels in these areas are more stable. The lakes receive some disturbance from human uses such as boating and fishing. The beaver ponds are providing waterfowl habitat but many of them are not active. The dams are becoming old and forming holes which break down the dam and drain the pond. Many of the streams lack preferred beaver forage such as cottonwood, aspen and willow. Currently, alder is the main non-coniferous species in the riparian areas. Other areas are being encroached upon by conifers which are not a preferred forage species. As natural meadows are shaded out by the conifers valuable waterfowl nesting, hiding, and foraging sites are lost. Mallards and common mergansers are the most common species nesting in the lakes and beaver ponds.

Great blue heron are abundant along the Pend Oreille River. In the spring hundreds of heron can be seen migrating through the area. There is a rookery on National Forest System Lands along the river. This rookery is 5 miles north of the closest unit for this project. It typically has 12 to 20 active nests a year. With 2 to 4 young in every nest. Heron can usually be seen at many of the upland lakes and streams in beaver ponds. There are no known nests on National Forest System Lands in the uplands, but that does not prove their nonexistence there. Individual nests can be hard to located an identify in upland area. It is assumed they nest in large ponderosa pine in the vicinity of lakes and beaver ponds. No data was available to establish trends although the WDFW has noticed a decline in large rookeries in Pend Oreille county. In the early 1800s (1809-1811) David Thompson recorded seeing huge numbers of "gray cranes", believed to be great blue herons, along the banks of the Clark Fork River (Pend Oreille River).

Beaver and waterfowl habitat can be improved in wide valley bottom with streams gradients less than 5%. Hardwood tree species can be planted or reestablished which would provide forage for the beaver. By maintaining beaver in the stream systems the ponds would be retained therefore providing needed habitat for waterfowl, great blue herons, and other forest wildlife species.

Direct and Indirect Effects of the Alternatives

Alternative A: There are no harvest units in this alternative. Habitat for these species is expected to stay as they currently are in the short term. In the long term suitable habitat for these species is expected to decline because of the encroaching conifer stands of trees. Hardwoods, meadows, and sedges would decline as the conifers shade out the characteristics needed by waterfowl, beaver, and great blue heron.

Alternatives B, C, D, E, F, G: The action alternatives would not impact wetlands or riparian areas that these species utilize for the majority of their needs.

Cumulative Effects

Because neither this project nor any of the current and reasonably foreseeable actions have an impact on habitat, there are no cumulative effects.

Old growth dependent species (barred owl)

The Forest Plan emphasis for MA-1 is Old Growth Dependent Species Habitat with the barred owl as the **management indicator species.** The core area and forage area of these units must be at least 600 acres in size. There are two units within the analysis area. The Cooks Lake unit was analyzed during the New Moon Ecosystem Analysis and was determined to be suitable. Barred owl surveys found the species inhabiting the area. The Marshall Lake unit has not been surveyed for suitability. The unit would be surveyed during the Indian Creek Ecosystem Analysis, after the Douglas-fir beetle has stabilized and habitats can be evaluated for suitability.

Direct, Indirect and Cumulative Effects

None of the alternatives propose activities in Forest Plan MA-1 areas.

Franklin's grouse

Franklin's grouse is a **management indicator species** in the Forest Plan. The Forest Plan emphasizes extensive areas of lodgepole pine to be managed with Franklin's grouse habitat needs. These 5,000 acre areas must have at least 1,000 acres of young forested stands, less than 20 years old. This analysis area does not contain suitable habitat for Franklin's grouse. Franklin's grouse have not been reported in the resent past in this area, although they have been documented by the WDFW 10 miles north of the analysis area.

Direct, Indirect and Cumulative Effects

None of the alternatives propose activities in Franklin's grouse habitat.

Northern Bog Lemming

The Forest Plan directs management of northern bog lemmings as **management indicator species** in moist meadows and bogs. This analysis area does not contain suitable habitat for bog lemming as specified by the Forest Plan. Bog lemmings have been found in the riparian zone along Browns Creek. This project would not have activities in riparian zones.

Direct, Indirect and Cumulative Effects

This project would not impact northern bog lemmings.

Goshawks

Goshawk were identified as a species of concern in the Regional Forester's amendments 1 and 2. These amendments developed standards for management around goshawk nest sites.

- *Protect every known active and historically used goshawk nest-site from disturbance.*
- *30 acres of the most suitable nesting habitat surrounding all active and historical nest tree(s) will be deferred from harvest.*
- *A 400 acre "Post Fledging Area" (PFA) will be established around every known active nest site.*

There are 2 known nest sites for goshawk in the analysis area. The Geophysical nest site has not been active since 1997. The nest site at Bead Lake was found in 1998 and produced at least one fledgling.

Neither nest site is within or nearer than 1 mile from any proposed harvest units in any alternative.

Direct, Indirect and Cumulative Effects

There would be no effect to any known goshawk nests. Any goshawk nests that are located during layout or implementation of this project would be subject to the district wildlife biologist's evaluation and forest plan standards and guidelines for protection.

Effects of Opportunities

The proposed **timber stand improvement** projects (pre-commercial thinning and pruning) would have no effect of any species except perhaps lynx. Lynx sometimes use dense stands for forage habitat. Before any specific pre-commercial thinning is proposed, the project would be reviewed by a wildlife biologist.

The proposed **watershed restoration** projects (road obliteration) would improve wildlife habitats for several species by increasing seclusion.

Consistency with the Forest Plan

As described in the analysis for each species, all alternatives meet the Forest Plan standards and guidelines for all management indicator species. The project is expected to have no impact on the following management indicator species because their habitats or habitat areas do not occur within the proposed activity areas: northern bog lemming, Franklin's grouse, barred owl, great blue heron, beaver, waterfowl. The proposed activity areas do include habitat for the following management indicator species, but the impacts are within the standards in the Forest Plan: woodpeckers, blue grouse, and pine marten.

Beetle-caused mortality would reduce crown closure in elk winter range. The Skookum herd unit is projected to have cover below that recommended in the Forest Plan, regardless of the alternative selected. None of the harvest alternatives bring the cover any lower. Both herd units currently have a wintertime open road density that is higher than recommended by the plan. All action alternatives reduce the wintertime open road density, but fail to reduce the wintertime open road density to meet the Forest Plan standards and guidelines.

Consistency with Regional Forester's Amendments Nos. 1 and 2

The analysis of structural stages required by Regional Forester's Amendments Nos. 1 and 2 (the Screens) is discussed in detail in the Vegetation section earlier in Chapter III. In summary, the analysis area is deficient in structural stages 6 or 7 in every biophysical setting except 11 (cedar/hemlock). Although late/old structure (LOS) is within the historical range of variability (HRV) in BS 11, we anticipate that because of beetle mortality, some LOS stands would move back to SS 1 (stand initiation) or 4 (multi-storied stand reinitiation without large trees). Therefore, the proposed action and all action alternatives except alternative G adhered to scenario A of the screen's wildlife standard.

To meet scenario A, the following standards were followed:

- *No live 21" or greater d.b.h trees would be harvested except as necessary for safety.*
- *No harvest is proposed in LOS stands*
- *Where possible, treatment would move stands toward open, parklike conditions.*
- *No harvest is proposed that would compromise crown closure or size of currently suitable corridors.*
- *Harvest in currently non-suitable corridors would leave patches of unharvested trees and understory vegetation as well as all snags and down wood.*
- *Snags would be maintained at 100% of population potential for cavity nesters.*
- *Existing coarse woody material would be maintained to provide the levels required by the screens.*

More detail on how the alternatives were designed to meet the above standards can be found in the mitigation measures section of Chapter II.

RECREATION

CHANGES BETWEEN THE DRAFT AND FINAL EIS

An analysis and discussion of the effects of the alternatives on roaded access was added to the Recreation discussion between the Draft and Final EIS.

REGULATORY FRAMEWORK

The Multiple-use Sustained Yield Act of 1960 provides the underlying direction that outdoor recreation and scenery are uses for which the National Forests must manage. General management direction for recreation and scenery is supplied by the 1988 Colville Forest Plan on pages 4-35 through 4-36, and direction specific to management areas is on pages 4-69, 4-77, 4-93, 4-97, 4-103, and 4-105. The goal of the Colville National Forest is to provide a broad spectrum of developed and dispersed recreation opportunities to meet public demand.

The Forest Service is in the process of developing a new road policy. At this time, the Forest Service has adopted an interim policy which prohibits road construction in certain unroaded areas for up to 18 months.

AFFECTED ENVIRONMENT

As reported in the Interior Columbia Basin Ecosystem Management Plan Assessment, nearly 500 small rural communities of 10,000 people or less can be found in the Columbia River Basin. North Idaho and eastern Washington are becoming destinations, rather than stops along the way. People living in Spokane County, the most populated county in the Columbia River Basin, use all areas of the Idaho Panhandle and Colville National Forests as major destinations for outdoor recreation.

Definitions

Recreation Opportunity Spectrum - Recreation opportunities includes a combination of activities, settings and facilities which to some extent predict the probable experiences a visitor to a given area might have. This arrangement of social benefits is called the Recreation Opportunity Spectrum (Forest Service Handbook 86). The Recreation Opportunity Spectrum concept provides a framework which allows administrators to manage for and users enjoy a variety of outdoor environments. The Recreation Opportunity Spectrum is not a land classification system: it is a method of describing and providing a mix of recreation opportunities.

Finally, access to wildlands for the purposes of recreation experience can be quantified and classified by method of access.

Recreation Opportunities

Browns Lake Area : Browns Lake lies at the end of Forest Road 5030. It occupies 94 acres and has a shoreline of about 2.2 miles. Because Browns Lake is designated as fly fishing only as well as non-motorized it provides an important recreational fishing opportunity. This site is extremely popular with fly fishers and receives heavy day use from the opening to the close of fishing season (May 1 to October 30). Other resources at this site include an 18-unit campground which is one of the most popular on the district and is currently managed under a concessionaire permit. The campground has an average of 4,500 campers each season with an occupancy rate of 70% from Memorial Day to Labor Day. A Civilian Conservation Corps cabin, which is eligible to be placed on the National Historic Register, is also located within the campground. Trail 320,

which is non-motorized, leaves from the campground and runs along the south side of the lake. This trail is one mile in length and accesses an ancient cedar grove as well as an interpretive site with a fish-viewing platform. Average use per year is 4,000 hikers. Twenty dispersed campsites are located within the Browns Lake area. Common recreation activities occurring in this area include hiking, picnicking, forest product gathering and use of Off-Road Vehicles.

Half Moon Lake is two miles southwest of Browns Lake and lies along Forest Road 5030. No overnight camping is allowed at the small parking and portage area. The lake is stocked and receives a fairly significant amount of day use.

Skookum Area: Both South and North Skookum lakes lie in this area. North Skookum is located on state land and is managed for the Washington State Department of Natural Resources. It is a popular fishing and camping spot for many visitors. Five dispersed sites are scattered around North Skookum and receive heavy seasonal use.

South Skookum Lake covers 38 acres with a shoreline of 1.09 miles. The campground lies on the west side of the lake and includes 25 units which are operated under a concessionaire permit. The number of campers averages 5,500 per year with the number of day users equal to or exceeding that amount. Occupancy on weekends is 95% or better. This lake is stocked with cutthroat trout by the Washington Department of Fish and Wildlife and is a popular fishery. The trailhead for Trail 138 lies within the campground. This 1 1/2 mile non-motorized trail loops around the lake and is popular with users because of the scenic viewpoints. It receives heavy use from campers as well as day users with an annual average of 5,000 users. Seven dispersed sites lie in the surrounding area and provide recreation opportunities for a number of forest visitors. South Baldy lookout overlooks the campground and is a popular day trip for many users.

Kings Lake Area: Kings Lake trailhead/parking facility is a designated Washington State Sno-Park for the Bead Lake/Galena Point trail system. It serves as a major hub for snowmobile use on both the Newport and Priest Lake Ranger Districts. The facility has a capacity of up to 50 vehicles as well as information boards and chemical toilets during the winter season. Within the Newport analysis area, users can access over 75 miles of groomed snowmobile trails via County Road 3389 and Forest Roads 1920 (CCA Road), 5080 (Sheepherder) and 042 (Snowshoe). This system connects with the Bead Lake area via Forest Road 5015 (Cooks Lake) as well as tying into the Priest Lake Ranger District system.

Off-road motor vehicle use is becoming a growing activity in this area which is indicative and typical for the urban interface front. Jeeps and all terrain vehicles are using old roads, fire lines and logging trails throughout the area. This activity is largely unregulated do to limited funding in the Ranger District's recreation budget.

Kings Lake itself serves as an important state fishery as the majority of cutthroat trout eggs are collected at this spot for the most of the eastern Washington lakes. National Forest System land borders the lake on the southeast corner, but the rest is privately owned. The lake has a shoreline of 1.22 miles and covers 54 acres. No dispersed sites exist along the lake.

Cooks, Mystic, and No Name Lakes: Cooks Lake is one of the most heavily used dispersed site areas on the district, the lake covers 16 acres and has a shoreline of 1.06 miles. Ten campsites are scattered around the lake. On weekends from Memorial to Labor Day this area has a 100% occupancy rate. The lake is planted with cutthroat trout and is a popular fishing spot with locals as well as people from outside the area.

Mystic Lake has six dispersed campsites which are repeatedly used during the summer season. The lake has a shoreline of 0.81 miles and covers 19 acres. This lake is also stocked with cutthroat trout.

No Name Lake covers approximately 22 acres with 1.3 miles of shoreline. This lake receives the highest amount of use on the ranger district, Occupancy is 100% on weekends and the area is frequently utilized

during the week by campers and day users. The lake has two main camping areas. Ten sites exist within the loop area and the portage area contains 5 sites. The most common recreation activities enjoyed by forest users at this lake are fishing and swimming.

Geophysical/Indian Creek Area: This nordic trail system is located adjacent to the Indian Creek Road and is part of the Washington State Sno-Park system. The non-motorized trail covers 6.6 miles of rolling terrain and is groomed as weather conditions permit. The parking area is plowed by Pend Oreille County on a regular basis during the winter months. During the summer the area is popular with mountain bikers.

Indian Creek which is located in this area, is fished in isolated spots. Forest Road 1914 provides a favorite spot for muzzleloaders who hunt white-tailed deer.

Bead Lake Area: The southwest portion of Bead Lake is privately owned, but the majority of the land surrounding Bead Lake is National Forest. The lake covers 722 acres and has a shoreline of about 10.3 miles which makes it the biggest lake in the project area. Trailhead parking for the Bead Lake trail system (Trails 127 and 127.1) lies on the south side of Forest Road 3215. This non-motorized trail winds through a mixed conifer forest and offers spectacular views of the lake. The main trail is 6.9 miles in length and the spur trail covers another 1.5 miles. Ten dispersed sites lie along the lake and are accessed by boat, foot travel or by horseback. One recreation residence, which is accessed by boat, lies at the north end of the lake. A public boat launch was constructed in 1998, which opens up more fishing opportunities. It will be open from May through October and be staffed by a full-time Forest Service host. At the present time the lake is not stocked, but non-native kokanee and burbot are taken from these waters.

This area also serves as a hub for snowmobile activity. The Bead Lake loop uses County Road 3389 and Forest Road 3215 (Bead Ridge) to access over 25 miles of groomed snowmobile trails.

Marshall Lake: This lake covers 195 acres with a shoreline of about 3.8 miles. It has two main dispersed campsites which are accessed only by boat. Two smaller dispersed sites are used primarily for day use. A privately owned campground is operated at the south end of the lake with a public boat access adjacent to it.

Pioneer Campground: This campground has 14 sites and lies two miles north of U.S. Highway 2. It receives heavy use by both campers and day users. The campground has an average use of 4,500 campers with a 75% occupancy rate. Other facilities include a picnic area along with a short interpretative trail which is classified as a Heritage site. The boat launch which accesses the Pend Oreille River is a popular launch for boaters using the Pend Oreille River. This campground and associated facilities are also managed under a concessionaire permit.

Divide Trail: Although this system is not currently maintained, the "Divide" is a unique and prominent feature of the planning area, and the historic trail continues to have some sections heavily used by backcountry horseman organizations.

ENVIRONMENTAL CONSEQUENCES

Methodology

The evaluation of the effects to the recreation resources can seldom be measured quantitatively. Often a qualitative judgement of the effects must be made. Many of the effects of the proposed alternatives on the recreation resources were based on observations, training, personal contact with recreation user groups , research regarding visitor attitudes and expectations, as well as the use of best professional judgement by the District Recreation Specialist and the Interdisciplinary Team.

It is possible to measure effects more quantitatively on the following items:

- *Temporary or long term impact to developed recreation sites.*
- *Effect to Recreation Opportunity Spectrum settings and opportunities.*
- *Effects on District trails.*
- *Effect on District snowmobile trail system.*
- *Effect on road access.*

The goal of recreation management in a wildland locale is to provide a variety of settings that allow a diversity of outdoor recreation opportunities for visitors. Recreation opportunities include a combination of activities, settings and facilities which to some extent predict the probable experience a visitor to a given area might have. This arrangement of social benefits is called the Recreation Opportunity Spectrum, (ROS).

The ROS concept provides a framework which allows administrators to manage for and users enjoy a variety of outdoor environments. The ROS is not a land classification system: it is a method of describing and providing a mix of recreation opportunities. The ROS has been divided into six major classes for Forest Service use: Urban, Rural, Roaded Natural, Roaded Modified, Semi-Primitive Motorized, Semi-Primitive Non-Motorized and Primitive.

Recreation activities could be affected by changes in road access, such as road obliteration, rehabilitation and reconstruction. Where roads are obliterated, both motorized and non-motorized access may be lost. Road rehabilitation (removing culverts or fill slopes) would effectively eliminate motorized access, but would allow some level of non-motorized road access. Road reconstruction could improve access conditions, but would not increase the amount of available access.

Effects Common to All Action Alternatives

None of the alternatives propose activities within developed recreation facilities -- campgrounds, picnic grounds or boating launch areas. Pioneer and Panhandle campgrounds are being treated with pheromone packets to reduce and control damage from the beetle. The Ranger District has a normal vegetative maintenance regime for developed recreation facilities. This regime will suffice to handle any insect damage that occurs in the developed facilities.

In all action alternatives, the ROS would not change. Within all areas a number of roads exist, ranging from those usable by automobile to many that are partially or totally closed by brush or constructed barriers. There are fairly numerous timber harvest units -- varying in age from a few years old to several decades. Logging units range from partial cut sites where scattered stumps are the only evidence of timber harvest to clearcuts. Some clearcut units may be well regenerated with immature trees, while others are still dominated by brushy vegetation. Ample opportunities remain to enjoy outdoor recreation activities in a partially human-modified environment that still contains a high degree of naturalness.

Many miles of roads would remain open to normal vehicle travel. Access via roads would be maintained to all developed recreation sites and National Forest system trails. Access to heavily used dispersed sites in the Mystic, Cook, and No Name Lakes area may be effected by heavily haul route traffic.

On the Priest Lake district, the Goose Creek (road 333) and Consalus Creek (road 1108) would be obliterated under all action alternatives except Alternative F (private land protection). This action would affect the availability of these roads for snowmobile grooming by the State of Washington. The Washington State groomed system would be reduce by approximately 9 miles with this action. This would effect the entire system accessed from the Kings Lake Snow Park on the Newport District.

There may be temporary interruption of recreational road travel within some portions of areas due to logging operations or other management activities. Generally this is a short term disruption of less than two months. Winter recreation travel routes may be affected by plowing when the purchaser chooses to winter log. All-terrain vehicle travel opportunities would continue to be available on old road systems. Hunting opportunities would be maintained with access by road and off-road travel except in areas with big-game (elk) winter range motorized restrictions.

There are no restrictions on recreationists entering National Forest lands in any of the areas with the exception of possible short-term restrictions in active timber harvest areas for the purposes of public safety and big-game (elk) winter range motorized restrictions.

Dust, smoke from prescribed fires, equipment and machinery noise including helicopter operations are possible temporary conditions in all action alternatives.

Direct and Indirect Effects

Alternative A

This is the no action alternative. Selection of this Alternative would not effect developed recreation facilities and would not effect the ROS class in the Areas. In areas where beetle killed trees surround recreation trails there would be a higher cost for maintenance incurred as more than a normal amount of deadfall would occur on trails for several years.

Dispersed recreation may be effected with impaired access on travel routes due to blow down or erosion problems. There would be increased fuel loading which may result in larger wildfires which could threaten recreation facilities and opportunities throughout the Newport Ranger District.

Openings in the timber cover would occur due to the beetle attacks. These openings would be difficult to travel through by any means with the downed trees limiting recreation access.

Recreational fisheries would be unaffected with possible exception of large wildfire fire occurrence.

Effects of Alternatives B, C and E

Browns Lake: There would be no effect to the campground or the dispersed sites located at Browns Lake. There would be no effect to the Browns Lake Trail (320). There would be no effects at Half Moon Lake.

Light reconstruction of 1921 to Browns Lake and Browns Creek would have a positive effect on recreation access to this area.

Skookum: There would be no effect to the five dispersed sites or the developed sites located at South Skookum. There would be no effect to the trailhead or the South Skookum trail (138).

Recreation access for such dispersed activities as huckleberry picking and hunting would be reduced with the partial closure of road 1900016, accessing the head waters of the South Fork Skookum Creek. This road would no longer serve as a through route to Sandwich Creek. This closure is listed as newly restricted access. There is an alternative route on 1900018 to Sandwich Creek. This road is challenging in a four wheel drive.

The light reconstruction of CR3407 would improve recreation access to the North Fork of Skookum Creek.

Kings Lake: If purchasers in the Kings Lake area winter log, snow plowing may effect the Bead Lake/Galena Point snowmobiling trail system. It serves as a major hub for snowmobile use on both the Newport and Priest Lake Ranger Districts where users can access over 75 miles of groomed snowmobile trails via County

Road 3389 and Forest Roads 1920 (CCA Road), 5080 (Sheepherder) and 042 (Snowshoe). This system connects with the Bead Lake area via Forest Road 5015 (Cooks Lake) as well as tying into the Priest Lake Ranger District system. If purchasers choose to logging traffic may affect the access to off-road motor vehicle enthusiasts.

Cooks, Mystic, No Name Lakes: Cooks Mystic and No Name Lakes are some of the most heavily used dispersed sites on the district. Because two units lie adjacent to Forest Road 5015, which is the main travel route for recreationists to travel into the area, these units would affect access. There would be no direct effects on these dispersed sites.

Geophysical/Indian Creek: Harvest activities would have no effect on the Nordic trail system. Harvest activities and hauling may affect activities along Forest Road 1914, which provides a favorite spot for muzzleloaders who hunt white-tailed deer.

Bead Lake: Harvest activities and haul route use may affect trailhead parking for the Bead Lake trail system (Trails 127 and 127.1) which lies on the south side of Forest Road 3215. Harvest activities would have no effect on the ten dispersed sites along the lake or the recreation residence at the north end of the lake. Haul route activities would not effect the access to the new public boat launch. If the purchaser winter logs this area the snowmobile activity would be affected by seven harvest units. The Bead Lake loop uses County Road 3389 and Forest Road 3215 (Bead Ridge) to access over 25 miles of groomed snowmobile trails.

Light reconstruction of 1914 would improve recreation access for light passenger cars into the Indian Creek area. Heavy reconstruction on 3215 to Bead Lake would improve recreation access to this area.

Marshall Lake: There would be no effect on the dispersed or privately developed site located at Marshall Lake.

Recreation access for such dispersed activities as huckleberry picking and hunting would be reduced with the closure of road 3215071, which is open and drivable. The level 1 obliteration would also cut off access for 3215075 a dead end spur. These two roads access the north end of Marshall Lake. The 3215 would have routine maintenance and would continue as access to this area. The extent of the effect to recreation with this closure is unknown.

Pioneer Campground: There would be no effect on the Pioneer Campground.

Divide Trail: None of these alternatives is anticipated to impact the trail.

Alternative D

The direct and indirect effects of this alternative would be similar to those in Alternative B but the additional harvest units would have the following additional effects:

Browns Lake: There may be an effect to two dispersed sites located along Browns Lake, due to the location of one harvest of unit. The greatest effect would occur with the use of the site or a location near the site as a helispot for helicopter logging.

Skookum: Under Alternative D, a dispersed site that is adjacent to a harvest unit would be directly affected with a helispot being located there. In addition to this, access would be blocked to two other dispersed sites.

Cooks/Mystic/No Name Lakes: In addition to two harvest units which lie adjacent to Forest Road 5015, Alternative D include five other units. These addition units would have an even greater effect on the main travel route for recreationists to travel into the area. One unit may have a helispot located across from the

entrance road to Cooks Lake. This would require the temporary closure of this dispersed recreation site due to safety concerns.

Bead Lake Area: If the purchaser winter logs this area, the snowmobile activity would be affected by several harvest units. The Bead Lake loop uses County Road 3389 and Forest Road 3215 (Bead Ridge) to access over 25 miles of groomed snowmobile trails. There are additional roads being obliterated under Alternative D. Road 3200016 near Lodge Creek which flows into Bead Lake would be obliterated under this alternative. The general area can be accessed via the Bead Lake trail. The road is currently closed to motorized use, so public access would remain essentially unchanged.

Alternative F

Prescribed burning and timber harvest, would have about the same effects as in alternatives B, C, D and E. Units in the Bead Lake Basin would not be harvested or burned, so there would be less disruption to recreation opportunities in that area.

Alternative G

The direct and indirect effects would be similar to other action alternatives but without timber harvest activities and the temporary disruptions anticipated. The ROS condition of roaded and natural appearing would be retained but there would be fewer old roads in the project areas that would have drainage structures intact.

Cumulative Effects of Alternatives A through G

Prescribed burning would have about the same disruptive effects as the proposed timber harvest, which includes some fuel treatment. The interruption in recreation activities and opportunities during prescribed burning activities might be of slightly less duration than during timber harvest activities. The effect would be different because burning is less likely to damage facilities than the mechanical logging operations would be.

In all action alternatives, the possibility of increasing use of the areas by **All Terrain Vehicles** (ATV) exists. ATV use has greatly increased on the ranger district in the past decade. The pattern of use of ATVs has included utilization of logging roads, skid trails and firelines. It is likely that new developments of this kind would be used by ATVs and possibly larger sports utility vehicles.

Conversely, there is a possibility of diminishing ATV use in the analysis areas through the proposed actions of road rehabilitation that would remove drainage structures, and partially obliterate short segments of roads primarily where they intersect open roads. Road rehabilitations proposed would inhibit access and use of old roads by ATVs.

The opportunity to enjoy recreational activities in a roaded but natural appearing wildland setting would be retained in any alternative.

Various operational activities within the areas would temporarily displace some recreation activities into other parts of the Newport Ranger District or other wildland areas where outdoor recreation is permitted. Disruption of the groomed snowmobile route may result in some displacement of snowmobilers. The amount of displacement would depend on the amount of disruption to the system by winter logging. The loss of 7 miles of groomed snowmobile trail in the Washington system would result in increased use on the remaining Washington system. There would likely be little displacement to the Idaho system because of the registration requirements in a different state.

Timing of harvest activities may temporarily affect access to groomed snowmobile trails, and would necessitate information dispersal on the closure and signing.

Effects of Opportunities

Timber stand improvement projects (thinning and pruning) would not impact recreation use. **Watershed restoration** opportunities were identified. These opportunities include obliteration of more roads. Most of these roads are currently open. This obliteration would further reduce road access to this area.

Consistency with Forest Plan Standards

All alternatives are consistent with the Forest Plan. Forest Plan standards would be met under all of the alternatives. None of the alternatives would impact developed recreation sites. Dispersed recreation sites would be protected. The area would continue to provide a spectrum of recreation experiences.

No road construction is proposed on the Newport analysis area. The Newport analysis area does not contain unroaded areas greater than 5,000 acres or unroaded areas greater than 1,000 acres that are adjacent to inventoried roadless areas or unroaded areas on other Federal ownership. Therefore, all alternatives meet the Forest Service's interim road policy.

SCENERY

CHANGES BETWEEN THE DRAFT AND FINAL EIS

The section was revised to improve readability.

REGULATORY FRAMEWORK

The Multiple-use Sustained Yield Act of 1960 provides the underlying direction that scenery is a use for which the National Forests must manage. General management direction scenery is supplied by the 1988 Colville Forest Plan on pages 4-35 through 4-36, and direction specific to management areas is on pages 4-69, 4-77, 4-93, 4-97, 4-103, and 4-105.

The various Forest Plan management areas have different visual management objectives. Management Areas 3A, 5 and 6 have visual quality objectives of Retention or Partial Retention depending on whether it is seen as foreground, middleground, or background. Management Areas 7 and 8 have visual quality objectives of Modification or Maximum Modification. In addition, the immediate foreground areas (approximately 500 feet) around significant dispersed recreation site will be managed to meet the retention visual quality objective, regardless of the management area in which they occur.

The Forest Plan identified areas with special sensitivity levels. Sensitivity levels are a measure of peoples concerns for the scenic quality of the National Forest. Sensitivity levels determined for land areas viewed by those who are: traveling through the forest on developed roads and trails; using areas such as campgrounds and visitor centers; or recreating at lakes, streams and other water bodies. There are three sensitivity levels for identifying the different levels of concern a visitor/user has for the visual scenery quality they experience (Level III areas include all other roads). These sensitivity levels were used to develop the management areas in the Forest Plan.

Level I is the most sensitive. Sensitivity Level 1 areas include State Highway 20, County Route 9325, County Route 9305, State Highway 211, Bead Lake Recreation Area, Bead Lake Trail, Marshall Lake, Mystic Lake, South Skookum Lake, South Skookum Campground, South Skookum Trail, Browns Lake, Browns Lake Campground, Browns Lake Trail, County Route 3029.

Level II is average or moderate sensitivity. These include Forest Route 5000, Forest Route 5000306, County Route 3389, Forest Route 5030, NoName Lake, North Skookum Lake, Kings Lake trailhead, and Kings Lake.

The Forest Service adopted a new scenery management system in 1996, after the Forest Plan was signed. This system is outlined in "Landscape Aesthetics - a Handbook for Scenery Management". Full application of this new scenery management direction will happen concurrent with revision of forest plans.

AFFECTED ENVIRONMENT

Overall, the scenic character of the analysis area through time has been a forested environment with a mixture of tree species. The primary cause of changes to the landscape character historically has been caused by large stand-replacing fires which covered portions of the project area. Human uses have altered the scenic integrity from historic conditions by homesteading, development of transportation systems, logging, etc. The composition of the forest also has been altered by the lack of fire in the environment over the past several decades with a much higher percentage of Douglas-fir, grand fir, and other shade-tolerant species than historic conditions.

Forest users place a high value on scenic integrity. Scenery plays a major role in the attraction some people have to the Pend Oreille River basin and in the special feelings the area invokes.

It is typical that most of the users of the area and people residing and working in the area, value the National Forests for not only their economic stability but would also like to have management activities occur in such a manner that the scenic value of the area is not degraded.

Scenic Values and Sense of Place

The "Sense of Place" for the area includes accessible opportunities for viewing scenery, gathering miscellaneous forest products, viewing of wildlife, hunting, and summer and winter recreational activities. All of these things are important as well as the knowledge that the forests are also being properly managed to provide for multiple-use benefits which include jobs in the forest products industry as well as other special uses. The concept of "Sense of Place" focuses on the subjective and often shared experience or attachment to the landscape emotionally or symbolically. It refers to the perception people have for a physical area with which they interact, whether for a few minutes or a lifetime. It gives the specific area special meaning to them, to their community, or to their culture.

The categories for this planning area are:

1. *Wildlands - Includes high mountains and high mountain meadows, rocky summits, timber line. It is valued for its natural environment. Trail based recreation predominates. The scenic value is very high. Bead Lake, Mystic Lake and South Baldy are wildlands.*
2. *Scenic Corridor - Valued for long range vistas. The scenic value is very high. Bead Lake, South Baldy, Browns Lake/Browns Creek, and Kings Lake road are scenic corridors.*
3. *Timberland - Widest range of activity, that is independent of landscape aesthetics. The scenic value is low. Bear Paw Ridge, South Baldy, Sandwich Creek, Indian/Bead flat, and Kings Lake road include timberland.*
4. *Water Bodies and Corridors - Includes lakes, rivers, streams. The focus is on water based activities. The scenic value is high to moderate. Marshall Lake, Bead Lake, Mystic Lake, South Baldy, and Browns Lake/Browns Creek are water bodies and corridors.*

Existing Landscape Character

Every landscape changes over time, in turn, the Landscape Character continues to change whether it is actively managed or evolves naturally. In the Newport analysis area there has been a change in historic vegetation species and vegetation patterns. These changes have been discussed in the vegetation section. The resulting patterns are becoming less sustainable in the long-term due to the increasing risk of fire and bug infestations.

The majority of the analysis area is viewed from many locations, and is perceived as having a somewhat natural appearing Landscape Character. **Landscape Character** gives a geographic area its visual and cultural image, and consists of the combination of physical, biological and cultural attributes that make each landscape identifiable or unique. A "natural appearing" landscape is a landscape character that has resulted from human activities, yet appears natural, such as historic conversion of native forests into farmlands and pastures that have reverted back to forests through reforestation or natural regeneration.

Variety class refers to the degree of diversity in a character type. Variety classes are obtained by classifying the landscapes into different degrees of variety. This determines those landscapes which are most important and those which are of lesser value from the standpoint of scenic quality. The classification is based on the fact that all landscapes have value and those with the most variety and diversity have the greatest potential for high scenic value. There are three variety classes used to identify the scenic quality of the landscape.

Class A - Distinctive, Class B - Common or typical, and Class C - Minimal. Variety Class B best describes the overall scenic quality of the Newport project area. However; Class A areas occur in the analysis area.

Scenic integrity refers to the degree of intactness and wholeness of the landscape character. Human alterations can sometimes raise or maintain integrity. More often it is lowered depending on the degree of deviation from the character valued for its aesthetic appeal. Scenic Integrity is divided into six classifications. The classifications are: Very High (unaltered), High (appears unaltered), Moderate (slightly altered), Low (moderately altered), Very Low (heavily altered), and Unacceptably Low (extremely altered).

The Newport analysis area, due to the mixed ownership, meets all levels of scenic integrity. For example: past harvesting activities are evident on State land, private timber land, private land, and National Forest System land. In particular, old clearcut units typically had straight line edges and often were larger than natural appearing openings, visible nearby. These old harvest units have a Very Low or Unacceptably Low scenic integrity level - landscapes appear heavily or extremely altered, deviations strongly or extremely dominate the valued landscape character, they borrow little if any form, line, color, texture, pattern or scale from the landscape character. There are areas on the Newport District like Mystic Lake, and Bead Lake with a High or Very High scenic integrity - landscapes where the valued landscape character is intact, the existing landscape character and Sense of Place is expressed at the highest possible level. These different levels of scenic integrity vary throughout the planning area. While driving, one may view an unacceptably low level and then drive into an area that has a higher level of integrity. The terrain is varied ranging from pastoral agricultural farmlands to semi-primitive areas of steep rocky outcrops. The majority of the recreation oriented people who visit the National Forests have an image of what they expect to see. Each area has its unique character.

The existing landscape character and sensitive viewing area viewpoints are listed below.

Marshall Lake - The viewer sees steep terrain, some public harvest activities, some road cuts, and natural openings. The area is mostly timber covered. There are homes, resorts, and summer homes along the lake. The area appears slightly altered. Moderate landscape character. Seen from Marshall lake, Highway 20 and County 3029.

Bead Lake - The viewer sees steep terrain, very little public harvest activities, very little road cuts, and natural openings. The area is mostly timber covered. There are homes, summer homes, boat launches, and a hiking trail along the lake. The area appears unaltered. High landscape character. Seen from Bead Lake, trail #127 Bead Lake, Highway 20, County 9305.

Mystic Lake - The viewer sees steep terrain, very little public harvest activities, very little road cuts and many natural openings. The area is moderately timber covered. There is a heavily used dispersed site along the lake. The area appears slightly altered. High landscape character. Seen from Mystic lake, Highway 20, and County 9305.

Bear Paw Ridge - The viewer sees steep terrain, harvest activities both private and public, road cuts and natural openings. The area is mostly timber covered. The area appears moderately altered. Moderate landscape character. Seen from Highway 20, County 9305, County 9325, County 3389 and South Baldy Lookout.

South Baldy - The viewer sees steep to rolling terrain, harvest activities both private and public, road cuts, and natural openings. The area is mostly cut over with a moderate timber cover left. There are homes, summer homes, resorts, campgrounds, trails, and a lookout. The area appears moderately altered. Moderate to low landscape character. Seen from Highway 20, highway 211, County 9325, County 9305, County 3389, South Skookum Lake, South Skookum Trail, South Skookum Campground, FS 5000, FS 5000306, FS 5030, North Skookum Lake, Kings Lake, Kings Lake trailhead and South Baldy lookout.

Browns Lake/Browns Creek - The viewer sees steep terrain, harvest activities both private and public, road cuts, and natural openings. The area is mostly timber covered. There are campgrounds and a trail. The area appears slightly altered. High to moderate landscape character. Seen from FS 5030, Browns Lake Campground, Browns Lake Trail, highway 20, County 9305, and South Baldy lookout.

Sandwich Creek - The viewer sees steep to rolling terrain, harvest activities both private and public, and natural openings. The area is mostly timber covered. There are private homes, farms and ranches. The area appears slightly altered. Moderate landscape character. Seen from Highway 20 and County 9305.

Indian/Bead Flat - The viewer sees rolling to flat terrain, harvest activities both private and public, road cuts, and natural openings. The area is moderately timber covered. There are homes, summer homes and a heavily used dispersed site at No Name Lake. The area appears moderately altered. Moderate landscape character. Seen from County 3029 and No Name Lake.

Bead/Marshall V - The viewer sees steep terrain, and few natural openings. The area is mostly timber covered. There is one home with a meadow and barn. The area appears unaltered. High landscape character. Seen from County 3029 and Highway 20.

Kings Lake Road - The viewer sees rolling terrain, few harvest activities both private and public, road cuts, and few natural openings. The area is a major travel way corridor for gravel trucks, recreational traffic, local traffic and logging traffic. The area appears moderately altered. Moderate landscape character. Seen from County 3389.

ENVIRONMENTAL CONSEQUENCES

Methodology

Timber harvest, road construction and fuels treatments can effect the appearance of a forested landscape due to contrasts created between natural appearing landforms and vegetation and those modified by management activities. These man-made changes are often expressed in artistic terms of form, color, line and texture. Contrasts are created by human-induced changes in vegetative cover and soil disturbances.

The ability to control how management impacts would appear when viewed with an artist's critical eye depends on the silvicultural system employed, logging techniques, terrain orientation to viewers, and logging slash disposal methods and completeness.

The appearances of the planning area today are quite different from what one may have seen if they lived in eastern Washington or northern Idaho in the early 1900's. This date would be in advance of times when much of the dramatic human influence on terrain including logging, cultural activities, settlement development and forest fire control began in earnest. Pre-turn of the century photographs, written descriptions, and dendrological studies paint a picture of a forested landscape somewhat different from the existing condition. Instead of today's uniform, thick, blanket of trees, the nineteenth century landscape was far more diverse. There were much larger numbers of western white pine, ponderosa pine and western larch in yesterday's forest. The overall appearance would be of more open stands of timber, larger trees in both height and diameter with more diversity in color and texture. Uncontrolled fires created a patchwork of openings in the timber, far more than one observes today.

One objective of scenery management for the long term might be to reintroduce a more representative mix of the long-lived trees and timber stands more "natural" to the region. Accomplishment of this goal may present unacceptable social effects. Many people who live here now might not accept a policy of letting wildfires run their natural course with no attempt to suppress them. Nor would many people accept wide spread clear-

cut logging to artificially open the land where, as with fire aftermath, trees could be planted and tended so that eventually; in a hundred years or so; things would more resemble prehistoric conditions.

Under the current Forest Service policy and the Colville Forest Plan, the goal of scenery management is to maintain, generally, the views people now enjoy from the key points of high visual sensitivity (identified in the Affected Environment section). Where there is an opportunity, planting would introduce a tree component that would in a small way help to diversify color and texture in the stand. Small openings created on timbered slopes would be in scale with existing naturally created openings and be irregularly shaped. The employed systems are evaluated as to their effects to visual quality as viewed from key viewpoints. Effects of burning are similarly evaluated.

The methodology in evaluating the effects of the various management proposals for the planning area involve the following premises.

The effects analysis identifies the methods for comparing the direct and indirect effects for each alternative, important interactions involved in each alternative, effects common to all action alternatives, direct and indirect effects analysis and cumulative effects analysis.

Four methods were used for comparing the effects of the alternatives.

1. *Visual Absorption Capability (VAC) estimated for each alternative.*
2. *Scenic Integrity Levels and Landscape Character estimated for each alternative.*
3. *Acres displayed by Visual Quality Objective (VQO) for Retention and Partial Retention for each alternative.*
4. *The estimated amount of canopy closure below 40% left on the landscape by acres for Retention and Partial Retention VQO's.*

The existing scenic condition of privately owned or other governmentally owned lands is considered in the overall visual effects of applied management on National Forest Lands. Fire, smoke from fire, helicopters and logging equipment is considered a short term and temporary impact on scenic integrity and was not considered in the effects analysis.

IMPORTANT INTERACTIONS

Thinning trees and associated activities of road construction and logging systems can affect the scenic resource by altering the naturally established form, line, color, and texture in a given viewing area or viewshed. The Landscape Character of the area and the existing Scenic Integrity level (condition) can be affected. Scenic impacts of the change depend on the interactions of the following:

1. *Access to stands by roads and skid trails.*
2. *Harvest methods and silvicultural systems.*
3. *Slash disposal methods.*
4. *Shape, size, and arrangement of harvest units.*
5. *Topographical relationship to viewers position and duration of view.*
6. *Existing Landscape Character and Scenic Integrity.*
7. *The ability of the viewshed to absorb change.*

Contained in the analysis file for scenery are tables which identify specific units, silvicultural prescriptions, logging methods, acres, road work, percent crown closure, and methods of fuel treatment for retention and partial retention for each alternative.

Effects Common to All Action Alternatives

All action alternatives would meet the Colville Forest Plan standards and guidelines by following the scenery analysis design criteria. All the **Visual Quality Objectives** would be met, the proposed harvest units would blend into the landscape from sensitive viewing locations, and the "Sense of Place" people have for the area would not change.

There will be trees that continue to die from beetle attacks. Some of these dead trees will continue to remain on the landscape. Natural openings will be created. The size will depend on the number of trees which die. Red crowns may be visible in all alternatives. The risk of large wildfires, which remove large patches of trees from the landscape, will still be a possibility with all alternatives. The scenic condition of the landscape is constantly changing, whether influenced by natural processes or human manipulations.

The highest level of **scenic integrity** in all analysis areas is considered "moderate", requiring a goal of partial retention (management activities remain visually subordinate to the characteristic landscape). In each alternative, portions of timber harvest units may be seen from key viewpoints. Burning and fire effects may be seen from key viewpoints. The size and shapes of units are similar for each alternative and would have similar visual effects.

Each of the 'seen areas' used in this analysis include small areas that are not actually visible from the established key viewpoints. This may be due to errors in mapping, or areas that are not currently seen because trees block the view.

The scenic attributes of the landscape for all areas is considered to be common, or typical for mixed conifer forest lands on the Colville National Forest.

Direct and Indirect Effects

Scenic effects within the Newport analysis area are quantified and interpreted based on how each of the alternatives changes the existing Landscape Character and Scenic Integrity. Landscape Character refers to naturally established landscape patterns that make each landscape identifiable or unique. Scenic Integrity is the state of naturalness or conversely, the state of disturbance created by human activities or alteration. The frame of reference for measuring Scenic Integrity levels is the valued attributes of the existing Landscape Character being viewed. The degree of scenic altered condition depends on the amount of changes seen from the sensitive viewing points. Altered condition in the landscape will be the greatest when most of the trees are removed in a given unit or area. Consequently, the least change would occur when the existing trees are not removed. The character of the landscape will be least affected when most of the existing trees are left intact. Landscape character changes will occur similarly to the Scenic Integrity. The following describes the Scenic Integrity rating criteria and Landscape Character associated with each. For this analysis, the focus will be on the vegetative element of Landscape Character.

Table III-295. Rating scenic integrity levels and landscape character of vegetation.

Scenic Integrity Levels	Landscape character and type of deviations	Degree of deviation from landscape character	Type of logging	Intactness of the Landscape Character
Very High	Naturalness is dominant, texture changes only	None	Helicopter	Fully expressed
High	Naturalness is dominant, some color & texture change	Not evident (light touch)	Helicopter Horse	Largely expressed
Moderate	Evident, but not dominant. Color, texture, with some line changes	Evident, but not dominant (light to moderate touch)	Skyline Tractor Helicopter	Moderately expressed
Low	Unnatural dominance. Changes in color, texture, line, & form are in scale with area	Dominant (moderate to heavy touch)	Tractor Skyline	Lowly expressed
Very Low	Unnatural dominance. Changes in line and form are in scale with landscape	Very dominant (heavy touch)	Skyline	Very lowly expressed
Unaccept-ably Low	Unnatural dominance. Color, texture, form and line are out of scale	Extremely dominant (extremely heavy touch)	Skyline	Not expressed

It is typical that most of the forest users rate old-growth stands to be most attractive, partial cutting (in the form of group selection) was rated as being the next most visually acceptable method, followed by harvest which left a two storied stand. The traditional clearcut is rated least desirable.

Table III-296. Scenic integrity and landscape character.

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Scenic Integrity and Landscape Character	High	Mod - Low	Mod - Low	Low	Mod	Mod - Low	Mod - Low

Of the action alternatives; Alt. E, will best meet the Scenic Integrity and Landscape Character of the landscape. The No Action alternative, barring the risk of wildfire, still remains high for this rating.

The degree of change in the landscape is based on the extent of openings created. Areas with a visual quality objectives of retention and partial retention have the highest degree of concern. The following table shows the acres to be treated in the retention and partial retention visual quality management areas. Unit specific information is contained in the scenery analysis file.

Table III-297. Acres meeting visual quality objectives in retention and partial retention VQO management areas, Newport planning area.

Visual Objective	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Foreground retention	126	0	0	278	0	278	278
Middleground retention	0	0	0	0	0	0	0
Foreground partial retention	0	0	0	0	0	0	0
Middleground partial retention	1,554	501	501	1,211	655	603	572
Background partial retention	799	433	433	786	604	706	464
Total acres	2,479	934	934	2,275	1,259	1,587	1,314

Because selective harvest is proposed, all the alternatives meet the Forest Plan visual quality objectives. No regeneration harvest units are proposed in retention and partial retention management areas. Of the action alternatives; Alt. B and C, have the ability to best meet VQO's of Retention and Partial Retention. The No Action alternative, shows the amount of acres which have a moderate to high probability of seen attacked trees, whether it is just one tree or many more. Not all the acres shown will have red crowns.

When crown closure falls below about 40%, the difference in texture is likely to be seen. Using design criteria, these units can be blended into the surrounding landscape. The following table shows the acres by alternative in retention and partial retention management areas where the crown closure is expected to fall below 40%. No acres in foreground retention, middleground retention, or foreground partial retention areas are expected to have less than 40% crown closure. Unit specific information is contained in the scenery analysis file.

Table III-298. Acres in retention and partial retention VQO areas estimated to have less than 40% crown closure after treatment, Newport planning area.

Visual Objective	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Middleground partial retention	189	189	299	137	189	188
Background partial retention	136	136	165	0	85	130
Total acres	*325*	*325*	*464*	*137*	*274*	*318*

The No Action alternative was not evaluated in this category, however; the probability of continuous patches of Douglas-fir being reduced below 40% existing canopy closure is high in Retention and Partial Retention VQO areas. Overall, Alternative E would be the best action alternative for the scenery resource.

Road obliteration activities in retention and partial retention would have a positive effect on the scenery resource. The straight line effects of roads would be eliminated in time from the landscape.

Cumulative Effects

Action Alternatives B, C, D, E, F and G: The existing landscape has been altered both by humans and natural occurrences whether it be insects and diseases, weather related landscape changes or natural succession. The alternative with the least acres affected in Retention and Partial Retention will be the best for the overall cumulative effect on the landscape. Refer to the effects analysis for VQO's. Alternative E would

be the best and Alternative D would be the least. Planting seedlings and natural regeneration helps to restore the openings only after a period of time. Approximately 10 to 20 years, the openings would blend into the landscape with no seen alterations.

No Action Alternative A: The natural occurrence of insects, in this case, Douglas-fir beetle would continue to evolve in the landscape. Douglas-fir trees would continue to die, creating heavy fuels for potential risk of wildfire. The scenery effects could be large openings on the landscape.

Effects of Opportunities

Timber stand improvement projects (pre-commercial thinning and pruning) would have no impact on scenery. **Watershed restoration** projects (additional road obliteration) in retention and partial retention would have a positive effect on the scenery resource. The straight line effects of roads would be eliminated in time from the landscape.

Consistency with the Forest Plan

All action alternatives would meet the Colville Forest Plan standards and guidelines by following the scenery analysis design criteria. All the Visual Quality Objectives would be met, the proposed harvest units would blend into the landscape from sensitive viewing locations, and the "Sense of Place" people have for the area would not change.

HERITAGE AND TRIBAL INTERESTS

CHANGES BETWEEN THE DRAFT AND FINAL EIS

The entire Heritage and Tribal Interests section was added to the EIS between the draft and final.

REGULATORY FRAMEWORK

Heritage resources include buildings, sites, areas, and objects having scientific, historic, or social values. They comprise an irreplaceable resource relating past human life. The "keystone" legislation of modern heritage resource management is the National Historic Preservation Act of 1966 (amended and expanded in 1976, 1980 and again in 1992). All other heritage resource management laws and regulations support, clarify or expand on the National Historic Preservation Act. Federal Regulations 36 CFR 800, 36 CFR 63, and Forest Service Manual 2360 (FSM 2360) contain the basis of specific Forest Service heritage resource management practices. All of these laws, regulations and direction, guide the Forest Service in identifying, evaluating and protecting heritage resources on National Forest system lands. The Forest Service is required to take into account the effect the agency's actions has on heritage resources that are either determined to be eligible for inclusion in the National Register of Historic Places (NRHP) or heritage resources that are not yet evaluated for eligibility. Eligible heritage resources are termed "historic properties". Specific locations of historic properties are exempt from disclosure under the Freedom of Information Act pursuant to 5 U.S.C. 552(b)(5).

A number of federal regulatory acts include an increasing role of tribes in the federal decision-making process. These acts include the Archaeological Resources Protection Act of 1979 which requires tribal notification and consultation where requested in regard to proposed removal of artifacts by permit from public lands; the Native American Graves Protection and Repatriation Act of 1990 which recognizes Indian control of human remains and certain cultural objects found on public lands and requiring consultation prior to authorized removal of such items; the National Historic Preservation Act of 1966, as amended in 1992, which more explicitly incorporates tribal involvement into the Section 106 consultation process and makes traditional use sites without physical remains eligible for listing in the National Register of Historic Places; and the Religious Freedom Restoration Act of 1993 which establishes a higher standard for justifying government actions that may impact religious liberties.

AFFECTED ENVIRONMENT

The Idaho Panhandle National Forests and the Colville National Forest have conducted heritage resource inventories of Forest lands beginning in 1976. From the data base of known historic properties and other relevant information, heritage specialists develop an understanding of what areas on the Forest have the greatest potential for containing historic properties. These previous inventories and accumulated knowledge guide the examination of any project area.

The chronology of human occupation of northern Idaho and adjacent areas of Washington can be broken down into three prehistoric periods. These include the Early Prehistoric Period (before 8000 years ago), the Middle Prehistoric Period (8000 to 2000 years ago), and the Late Prehistoric Period (2000 years ago to about 200 years ago). This is followed by the proto-historic period, when European cultures started to indirectly influence the Native Americans in the area (variable, but beginning in some areas 250 years ago to the actual coming of fur traders in the early 1800s).

The Kalispel and Coeur d'Alene Indians have occupied the northern Rocky Mountain area for thousands of years. Their settlements, at the beginning of the Historical Period, focused on the forest edges in valleys, around lakes and the camas grounds around Usk and Tensed. The Proto-Historic Period had a significant impact on both the Kalispel and the Coeur d'Alene peoples in the form of exotic disease epidemics, including

smallpox and measles, that spread in advance of contact with white populations and wiped out whole villages. As many as one half to one third of the population of Native Americans in the Northwest died during this period.

The beginning of the Historic Period (1809 to present), in northern Idaho and adjacent Washington, is marked by the arrival of fur trader David Thompson in 1809. The subsequent fur trade era and then the coming of the Jesuit missionaries in 1841 had a powerful impact on the Indian peoples. Changes that took centuries to occur in other parts of the country, took only a few decades in the Coeur d'Alene and Kalispel areas.

The construction of the Mullan Road in 1859 to 1862 is a time marker for the Coeur d'Alene River Basin. Before construction of the road, the basin was indisputably Indian territory and had an environment largely unaffected by man. The area population and environment swiftly changed after completion of the road. Thousands of prospectors flooded into the area in search of gold and silver starting in 1884. These miners gradually fanned out from the Coeur d'Alene Valley to other areas in the Idaho Panhandle and adjacent areas of Washington and Montana. The coming of the Northern Pacific Railroad in 1882 and the Great Northern Railroad in 1892 opened up the areas for further settlement and change. By 1900, the stands of commercial white pine in forests in the eastern United States were largely removed and lumber companies moved their operations into the Northwest. The mining and logging industries combined to dramatically change the character of the population and economy of the region.

Historic properties found in the project area related to prehistoric periods, include short term habitation and resource exploitation sites, locations of religious significance and routes of travel. The Proto-Historic Period may be represented by burials of Native Americans who died from disease epidemics brought to North America by Europeans. The historic properties related to the Historic Period include sites associated with mining, logging, homesteading, transportation and Forest Service administrative history.

ENVIRONMENTAL CONSEQUENCES

Methodology

When a project is proposed, Districts routinely involve heritage specialists in developing the project and analyzing environmental effects of the project. A heritage specialist reviews previous historical work, existing archives, overviews, the nature of the project, public involvement, and consults interested Native American groups (as defined in the ICBEMP, Appendices C, 1997). The geographic scope of the heritage resource analysis is the "area of potential effects". This is the geographic area within which a Forest Service project may cause changes in the character or use of historic properties, if any such properties exist.

A. Based on the above information the heritage specialist makes a judgement about the adequacy of existing heritage information to complete the environmental analysis and disclose effects on heritage resources. If there is insufficient information, the heritage specialist will develop a strategy to correct the deficiency. Once project alternatives are developed, the District defines the "area of potential effects" on historic properties in consultation with the heritage specialist considering both direct and indirect effects. A field inspection of the project area is required where no previous adequate inventory has taken place.

B. The heritage specialist designs a field inspection of the project area to locate all historic properties within the area of potential effects. If historic properties are located in the area of potential effects, they are documented thoroughly in order to make National Register of Historic Places eligibility determinations, provide adequate information for project planning, project redesign or restrictions or designation of sensitive areas where needed. This field work and background research is documented in a report and the heritage specialist coordinates recommendations, actions and monitoring with the project leader and the State Historic Preservation Office(s).

A project has an effect on a historic property when the project activities alter characteristics of the property that qualify the for inclusion in the National Register. For the purposes of determining effect, alteration to features of the property's location, setting, or use may be relevant depending on a property's significant characteristics and are considered.

A project is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to: physical destruction, damage, or alteration of all or part of the property; isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the National Register; introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting; and neglect of a property resulting in its deterioration or destruction.

A goal of the Forest Service heritage resource program is to manage heritage resources to prevent loss or damage before they can be evaluated for scientific study, interpretive services or other appropriate uses. Timber harvest is therefore carried out to avoid adverse effects on known historic properties. Where the proposed project results in impacts to historic properties, project design anticipates from the outset that treatment of the property conforms to sound preservation practice, and is consistent with the relevant standards. Project design assures that the essential form and integrity of historic properties is not impaired. If impacts to historic properties appear to be adverse impacts, appropriate mitigation treatments are determined in accordance with 36 CFR 800.5. Mitigation of impacts for timber sales can include, but are not limited to, establishment of buffer zones, directional falling, alteration of harvest unit boundaries, changes in road locations, designation of skid trails away from historic properties, limiting the harvest methods in certain areas, seasonal limitations, and limiting slash disposal and tree planting activities.

In cases where a historic property is related to Native Americans heritage or religion, the Forest would consult with the appropriate tribal representatives to help identify appropriate mitigation measures.

In the event that cultural resources or human remains are encountered during program activities, the Forest has the authority to modify or stop harvest activities. The standard heritage resources protection provision C(T)6.24, would be included in all contracts. The provision requires that the contractors and the Forest Service representatives work together to protect historic properties. Failure of the contractor to identify historic properties encountered during the harvest constitutes a breach of contract. The provision specifically requires the contractor to notify the Forest of such discoveries.

To evaluate alternatives, the heritage specialist provides the project leader with information on all of the historic properties within the area of potential effect, their location, character, the nature of any potential effects and the possible mitigation measures of potential effects.

Direct, Indirect, and Cumulative Effects at the Newport Ranger District Planning Area Scale

Disturbance of historic properties resulting from timber harvesting activities could potentially result from: road construction or reconstruction, tree falling, skidding, decking, and slash disposal. Certain types of historic properties are vulnerable to vandalism and looting. Construction or reconstruction of roads could result in indirect impacts by allowing the general public access to fragile historic properties.

A large portion of the Douglas-fir Beetle project area has been inventoried previously for heritage resources in conjunction with previous Forest projects. The known historic properties in the project area have been identified and considered in the development of project alternatives. The Forest is proceeding with consultation with the State Historic Preservation Office to determine the significance and effect of the project on the known historic properties. Areas not previously inventoried would be as soon as snow cover melts off and these findings would also be reported to the State Historic Preservation Officers for both Washington and

Idaho. No uninventoried sale would be sold prior to the inventory and consultation with the State Historic Preservation Officers. All historic properties would be protected and any effects would be mitigated in consultation with the State Historic Preservation Offices and, if necessary, the Advisory Council on Historic Preservation, the Kalispel Tribe of Washington and the Coeur d'Alene Tribe of Idaho prior to any timber sale or other land disturbing activity.

The Forest is in general consultation with the Kalispel Tribe of Washington and the Coeur d'Alene Tribe of Idaho concerning the nature of Douglas-fir Beetle Project. Tribal representatives received briefings concerning the nature of the project and the proposed action. They were afforded the opportunity to express their concerns with the project and the DEIS. The Kalispel Tribe highlighted their concern for the protection of one particular historic property. One result of these consultations is a more detailed treatment of Heritage Resources in the FEIS.

Consistency with the Forest Plan

Heritage and tribal interests are regulated by federal laws that provide direction and guidance to the Forest Service in identifying, evaluating and protecting heritage resources. The Forest Plan tiers to these laws and therefore, proposed action alternatives will meet Forest Plan standards.

FINANCES

REGULATORY FRAMEWORK

The Colville Forest Plan EIS (page III-155) indicated, "The Forest is an important commodity source for the region, providing about one fifth of the total timber supply as well as substantial watershed values and mineral potential." Forest Service policy sets a minimum level of financial analysis for timber sale planning (see Forest Service Handbook 2409.18 section 32).

AFFECTED ENVIRONMENT

Within the northeastern Washington market area, the Colville National Forest has traditionally offered 25% of the wood on the market. Based on the 1996 Timber Sale Program Information Reporting System (TSPIRS) report, volume harvested on the Colville National forest has dropped approximately 69% since 1987.

Based on the most recent information at the Forest level (TSPIRS, 1997, the most recent report), each million board feet of timber harvested on the Colville National Forest annually results in a total of 23 jobs and $632,730 income for that year. These figures include the impacts associated with harvesting and processing timber plus the impacts of Forest Service salaries and investment and the 25% fund expenditures.

Stumpage prices are noticeably down across the United States at present, largely due to financial problems presently plaguing the Asian nations. However, timber markets in the northwest do not seem to have been depressed as much as those in the rest of the United States. This is probably due to the growth that the region is experiencing.

The local timber market could be further depressed if the Asian economic problems continue. Due to the large diameter of the trees that would be offered for sale under this project, stumpage prices are expected to be somewhat resistant to such market conditions because historically large trees tend to be more highly valued by mills, especially if they can be peeled for veneer.

The monetary value of the trees will also depend on how soon they are harvested. Although the Douglas-fir beetle does not cause direct damage to wood it does serve as a carrier of fungal spores that can greatly deteriorate the sapwood, then penetrate the heartwood. Other beetles, such as pinhole bores, flathead borers, and roundhead borers also effect the value of beetle killed timber as they too degrade the sapwood and speed the spread of fungal rot.

Recent local sales of Douglas-fir timber by the Forest Service have brought bids of $200 to $257 per thousand board feet.

ENVIRONMENTAL CONSEQUENCES

Methodology

This analysis at the project level deals only with financial attributes (predicted costs and revenues) of each alternative; and approached the analysis as though each alternative, that contained timber harvesting, was a group of timber sales. The timber sales were, in turn, logical groups of proposed harvest units. An appraisal was then preformed for each group of units as though they were actually being offered for sale at this time. Thus the time value of money was not considered.

Because the market is not as robust as it has been, the analysis was made as real as possible by grouping the proposed harvest units; then a financial analysis was performed as though each group was a sale area. Thus,

stumpages and costs could be more accurately estimated and directly related to each other (so that the analysis would not be comparing averages where stumpage would perhaps be coming from one end of the district but the costs in reality were at the other end of the district in another sale area). In order to maintain the probability of financially viable timber sales the units can be regrouped pending actual field measurements (such as cruised volumes and specie mix) and the timber market at appraisal time.

Different revenues and costs are associated with the management activities under each action alternative. To arrive at the expected stumpages a computer program was used to determine the potential stumpage (i.e., gross bid value) of timber harvested, on a sale by sale basis. The program runs the same regression equation that is contained in the Transactions Evidence (TE) appraisal model[1], used for appraising actual timber sales. The TE appraisal method predicts the value of timber (referred to as "stumpage") through the use of several independent variables developed from recent similar sales within Region 1 of the Forest Service (northern Idaho and western Montana). Since the information used is from actual bidding, current local market conditions, and production costs for logging and milling are reflected in the predicted rate.

Other costs, such as road maintenance, fuel reduction (burning), and planting, were developed based on experienced District-wide costs. Road construction and reconstruction costs were based on past costs in the project area updated to today's costs. The project file contains detailed documentation of costs estimates.

Costs for road reconstruction, reforestation, mitigation and other direct costs are deducted from the expected stumpage value. The costs of upgrading existing arterial roads (main travel/haul routes) to further reduce long-term risks to the watersheds are included in the reconstruction costs.
The necessity of all proposed sale activity work (such as type and/or extent of fuel treatments, road work, etc.) that required of the purchaser was continually reviewed. The objective of these reviews was to make as much money available for Knutsen-Vandenburg funded watershed projects as possible. The harvesting alternatives also identified watershed improvement work that sale purchasers could perform identified, such as upgrading culverts, and/or removing culverts and closing roads. Due to government overhead, purchasers can accomplish work more economically.

Non-commodity values were not included in this analysis because these resources are evaluated under the specific resource section. Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) indicated that "For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are qualitative considerations." Effects on resources are documented in individual resource sections.

The description of the features of the alternatives presented in Chapter II was used for the financial analysis. The table below identifies additional features that would affect the finances of a commercial timber sale for each alternative. No timber would be sold if Alternatives A or G were implemented.

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[1] *The 1999 second quarter (W99C2) Transactional Evidence (TE) model was used to arrive at the expected stumpage value for the action alternatives containing a harvest feature.*

Table III-299. Additional Features Affecting Finances of a Commercial Timber Sale, Newport Ranger District.

Feature	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Net Volume (million board feet)	16.7	16.7	26.2	16.7	37.2
Yarding Systems Used (Percent of Volume)					
Tractor	15	15	34	15	47
Skyline	28	28	22	28	6
Helicopter	57	57	44	57	46
Average Diameter of Harvested Trees (Inches)	15	15	15	16	15

Table III-300. Cost Estimated for Project Activities, Newport Ranger District.

Activity	Cost
Roads: Timber Sale	
Maintenance during the sale (/MBF)	$0.54/mile/mbf
Maintenance (presale)	$500/mile
Light reconstruction	$7,000/mile
Heavy reconstruction	$15,000/mile
Level 1 obliteration	$7,000/mile
Roads: Forest Service, including overhead	
Light reconstruction	$12,390/mile
Heavy reconstruction	$26,550/mile
Level 1 obliteration	$12,390/mile
Maintenance (Presale)	$885/mile
Fuel treatment accomplished by the timber sale Purchaser	
Lop and scatter	$53.85/Acre
Pile landings:	$718.36/Acre
Fireline, hand:	$28.27/Chain
Fuel treatments accomplished by the Forest Service, including overheard	
Burn landings:	$133.46/Acre
Underburn:	$244.13/Acre
Essential regeneration accomplished by the Forest Service, including overhead	
Plant @ 8x8:	$829.18/Acre
3 stocking surveys	$37.05/Acre

Direct and Indirect Effects at the Newport Ranger District Project Area Scale

Timber harvest from the action alternatives would contribute to continuing operation of local mills, this, directly and indirectly enhancing the local and state economy through employment and tax revenues. These features would also be enhanced through employment created through the planned restoration activity work outside of the timber sale contracts. Additionally, 25 percent of timber receipts goes directly to Pend Oreille County, Washington, and Bonner and Boundary Counties in Idaho for public schools and roads for public schools and roads.

It is anticipated that the sale of Douglas-fir beetle killed timber, from National Forest Lands, would have very little effect on the price that private land owners will receive for their timber over the next two years for two reasons:

- *Most private landowners that also have beetle infested/killed timber have already made arrangements to have their trees harvested because the spring flight of the beetles is imminent; and they'll be wanting to commercially capture the value of the trees.*

- *The planned sale of beetle killed timber would replace a portion of what the Colville and Idaho Panhandle National Forests normally offer for sale yearly, which was a small portion of what is has been on the market in the last few years. Local timber company representatives have expressed no concerns about the Forest Service potentially "flooding the market" with Douglas-fir sawtimber.*

The following table provides a summary of the financial appraisal of each alternative.

The action alternatives would produce forest products over both the short and long terms; traditional employment opportunities in the woods product industry would be similarly affected in Alternatives B-F. Employment opportunities would also occur from planned restoration under all action alternatives.

Not managing the timber resource in this area (as under Alternatives A and G) would result in a loss of mature timber (of commercial size), reducing expected revenues.

Table III-301. Summary of the Financial Appraisal, Newport Ranger District.

	Costs/Revenue						
	A	B	C	D	E	F	G*
Timber Sale Revenue							
(1) Stumpage Value (gross)	$0	$3,031,865	$3,031,865	$5,800,506	$3,019,289	$9,168,923	$0
(2) Total MBF		16,732	16,732	26,193	16,732	37,224	0
Timber Sale Costs Affecting Predicted Bid							
(3) Road Maintenance (During)	$0	$192,502	$192,502	$305,690	$192,502	$462,836	$0
(4) Road Maintenance (Presale)		$4,150	$4,150	$6,200	$4,150	$3,550	$0
(5) Road Reconstruction	$0	$125,800	$125,800	$145,000	$125,800	$132,400	$0
(6) Road Obliteration (Sale Contract)	$0	$16,100	$16,100	$49,700	$16,100	$45,500	$0
(7) Slash Disposal (Purchaser)	$0	$48,478	$48,478	$72,548	$48,478	$48,478	$0
(8) Slash Disposal (FS)	$0	$219,812	$219,812	$400,227	$219,812	$219,812	$1,046,458
(9) Total Sale Contract Costs = Sum line 3 through line 10	$0	$606,842	$606,842	$979,365	$606,842	$912,576	$1,046,458
(10) Predicted Bid Value (net) = Line 1 - Line 9	$0	$2,425,023	$2,425,023	$4,821,141	$2,412,447	$8,256,348	($1,046,458)
(11)Predicted bid/MBF = Line 10/ Line 2	$0	$144.93	$144.93	$184.06	$144.18	$221.80	$0.00
						* Not a Timber Sale	
Other Project Costs							
(12) Reforestation	$0	$19,057	$19,057	$70,165	$19,057	$48,133	$172,380
(13) Road Obliteration (FS) for watershed restoration	$0	$26,019	$26,019	$34,692	$26,019	$34,692	$1,945,268
(14) Total Other Costs = Line 12 + Line 13	$0	$45,076	$45,076	$104,857	$45,076	$82,825	$2,117,648
(15) Value of Timber Sale Projects (Line 9 + Line 12)	$0.00	$625,899	$625,899	$1,049,529	$625,899	$960,709	$1,218,837
(16) Per MBF = Line 16/Line 2	NA	$37.41	$37.41	$40.07	$37.41	$25.81	NA
(17) Difference Between Predicted and Project Value per MBF = Line 13 - Line 18		$107.53	$107.53	$143.99	$106.77	$195.99	$0.00
Other Forest Service Costs							
(19) Planning	$481,375	$481,375	$481,375	$481,375	$481,375	$481,375	$481,375
(20) Sale Preparation	$0	$795,941	$795,941	$1,246,001	$795,941	$1,770,746	$0
(21) Harvest and Engineering Administration	$0	$63,377	$63,377	$101,319	$63,377	$139,668	$1,540
(22) Net Value (Line 12 - Line 15- Line 19 - Line 20 - Line 21)	$0	$1,039,254	$1,039,254	$2,887,589	$1,026,678	$5,781,733	($3,647,021)
(23) Present Net Value (Discounted)		$979,357	$979,357	$2,734,941	$967,423	$5,436,797	($3,164,371)
(24) 25% Fund (County) = Line 12 * .25	$0	$606,256	$606,256	$1,205,285	$603,112	$2,064,087	$0

** Costs of FS Road obliteration in Alternative G include reconstruction, maintenance and obliteration.*
** Alt G is not a Timber Sale*

Definitions

The **stumpage value** in the table reflects the size of timber harvested (average diameter), volume per acre, species composition, planned yarding method (helicopter, skyline, cable or tractor) and hauling distance (on paved and unpaved roads). **Timber sale costs** are those other costs that are considered in the timber purchaser's bid including contractual requirements. The timber purchaser is billed for Forest Service slash treatment to be completed after the sale.

The **predicted bid** is the stumpage price, minus the total of the other contractual costs. The estimated bid per thousand board feet is calculated by dividing the predicted bid by the estimated volume. Generally, the predicted bid is expected to be lower than the historical local bid for this type of timber, due largely to the value of the contractual items planned. Normally, a timber sale would not have as much road obliteration or reconstruction which is planned for watershed restoration. The other contractual items are generally indicative of the type and amount of contractual work required in a timber sale.

The **value of timber sale projects** was determined by adding all the contractual items, plus the cost of regeneration. This number indicates how much "cushion" is available in the bid before some of the projects would not be funded. In other words, it shows how much the price of a bid could fall, on the average, due to market forces and still cover anticipated work. On a sale by sale basis, this number was used to determine below cost sales when the value of timber sale projects was higher than the predicted bid (see below).

Timber Management Viability

Implementing stand-management treatments would depend on having financially viable timber sales that the local forest products industry is willing to purchase. Generating funds to help finance watershed and wildlife projects while having sales that are not below cost is also desirable. For this analysis, all identifiable costs associated with the timber sales (administration, mitigation, monitoring, sale preparation, and sale execution), were included.

When viewed as entire projects, no timber sale alternatives were below costs. When viewed as individual potential sale areas, Alternatives B and C have four sales (out of seven) that appear to be below costs. Alternatives E has three and Alternative F has none. In Alternative D, three sales appears to be below costs. All of these are due to Forest Service costs for planning. None of the timber sale alternatives have sales where the predicted bid is lower than the timber sale contractual costs and regeneration, indicating that sales would probably sell as proposed.

Cumulative Effects

Timber sales offered under this proposal in the Newport, Priest Lake and Coeur d'Alene areas would be in replacement of other planned sales for the next one to two years, thus an additional large volume of timber would not affect the regional timber market. Additional timber from private and state sources may have already landed in the market at a higher rate that would normally have occurred.

Consistency With the Forest Plan

Forest-wide goals, objectives, and standards for economics are not specifically addressed in the Forest Plan. This issue is addressed indirectly in the discussion of community stability. Chapter II of the Forest Plan states, "Produce forest goods and services in the most cost efficient way consistent with providing net public benefits. Generate revenues from permits, leases, user fees, and product receipts," (Page 4-2, Objectives). All the alternatives meet the above Forest Plan direction.

CHAPTER III - CONCLUSIONS

CUMULATIVE EFFECTS AT THE OVERALL PROJECT SCALE

Each resource specialist identified the cumulative effects analysis area appropriate to their resource and documented the rationale in the project file. The following table summarizes the approximate scale of the cumulative effects analysis areas for each resource. Cumulative effects are measured by using ecosystem analysis at the watershed scale, or finer, or broader scales; whichever is the most appropriate cumulative effects scale for a particular resource. The past, present and reasonably foreseeable projects have been listed in Appendix E. The type of activities evaluated in the effects discussions include current KV projects, ongoing timber sale harvest contracts, planned timber harvest, noxious weed projects, aquatics work, wildlife habitat improvement work, brush disposal work, mining, special use permits, recreation and trails projects, grazing allotments and permits, harvest on non-National Forest lands, road repair and relocation work, and prescribed burning for wildlife habitat.

Table III-302. Approximate scale of cumulative effects analysis areas, by resources.

Resource/Species	Idaho Panhandle NF	Colville NF
Vegetation	Project area	Project area
TES Plants	Project area	Project area
Noxious Weeds	Project area	Project area
Watershed	6th code scale watershed	6th code scale watershed
Soil Productivity	Project area	Project area
Fisheries	6th code scale watershed	6th code scale watershed
Fuels and Fire Behavior	Project area	Project area
Air Quality	Large surrounding areas	Large surrounding areas
Wildlife -Grizzly Bear	Bear Management Units	Project area
Wildlife -Lynx	5th code HUC watershed	5th code HUC watershed
Wildlife -Flammulated Owl / White-headed Woodpecker	5th code HUC watershed	Not Applicable
Wildlife -Fisher/Marten	5th code HUC watershed	Not Applicable
Wildlife -Northern Goshawk	5th code HUC watershed	Project area
Recreation	Project area	Project area
Scenery	Project area	Project area
Heritage and Tribal Interests	Project area	Project area
Finances	Idaho Panhandle Nat. Forest	Pend Oreille County

Cumulative effects discussed for each resource in Chapter III can rarely be detected beyond the local and cumulative effects analysis area scales. At the overall project scale, which includes portions of the Coeur d'Alene River, Priest Lake and Newport Ranger Districts, cumulative effects generally cannot be differentiated between the alternatives. The following discussions identify potential cumulative effects at this larger scale or, where none are expected, briefly explains why.

Vegetation Restoration

Combined Project Area Effects: Over the cumulative Douglas-fir Beetle Project Area which includes the Newport, Priest Lake, and Coeur d'Alene project areas, there would be a little over a 1 percent change toward desired species composition in Alternative D. Although the change is small, a continuation of actions over a

period of years would result in a much larger trend toward meeting restoration of the long-lived seral species desired on these landscapes.

Private lands: Private land ownerships would continue current landscape activities. Existing openings are mostly a result of permanent land clearing for homes and pastures. Harvest of dead and dying trees on industrial private lands is either completed or currently being planned and executed quickly to capture the value of the trees. Owners of small home sites and recreational property are less likely to harvest their beetle killed timber except for safety reasons. Timber harvests on private lands often tend to be selective removal of trees of highest economic value, usually the largest trees, and natural regeneration is relied on to fill in any created openings. This tends to favor shade-tolerant Douglas-fir and grand fir and typically removes any old forest structure. Although it is impossible to predict exactly what will happen on private lands, one estimate is that inherent disturbance regimes and historic ranges of variability in vegetation will never return on a landscape scale.

Structural Stages and Composition

Structural stage changes would occur as a result of the beetle infestation. Changes in structural stage to stand initiation are caused by beetle mortality; subsequent regeneration harvests are for the purpose of facilitating desirable regeneration rather than creating structural stage change. Even though green trees would be harvested in some stands in some alternatives, there are expected to be no changes in stand structure categories beyond that caused by the bark beetle, so the stand structures resulting from Alternative A would also apply to all other alternatives. Changes in species composition from Douglas-fir and grand fir to ponderosa pine, white pine and larch, would occur at the time of planting in harvested stands. These seral species are more likely to provide the desired mature and old forest structure in the future than the more root disease-susceptible species such as Douglas-fir and grand fir

Old Growth

Effects to old growth are limited to site specific areas and are not cumulative. Cumulative effects to old growth dependent wildlife are discussed in the wildlife section. Although no harvest beyond salvage is proposed in Late and Old Structural stands in Newport, and no harvest within old growth is proposed in Coeur d'Alene stands, the beetle prefers larger diameter trees and mortality is expected. With continuing Douglas-fir mortality, no long-term increase in old growth structure is expected. Since most of the Douglas-fir will die before reaching old growth, the trend will be a reduced level of old growth from historic conditions. On Priest Lake, dry site old growth ponderosa pine stands would be treated in Alternatives B, C, and D. By harvesting the dead Douglas-fir and understory trees, the remaining old growth ponderosa pine could likely be maintained as old growth. Underburning is also prescribed to reduce fuels and reduce the amount of competing vegetation. These activities will also increase the likelihood in some stands of younger ponderosa pine trees eventually growing into old growth.

Threatened and Sensitive Plants

An independent, site specific analysis of cumulative effects for Threatened and Sensitive Plants has been done for the Coeur d'Alene, Priest Lake and Newport Ranger Districts (see Threatened, Endangered and Sensitive Plants section, Chapter III). The following is a summary of cumulative effects for the entire project area within the EIS, which is defined as the Coeur d'Alene and Priest lake subbasins and the portion of the lower Pend Oreille subbasin on the Newport District, Colville National Forest.

Threatened Plants

There are no known occurrences still existing (extant) for water howellia (Howellia aquatilis) or Ute's Ladies' tresses (Spiranthes diluvialis) in the subbasins encompassing the three districts. These two plants are listed as

Threatened by the U.S. Fish and Wildlife Service (USDI 1999) and are suspected to occur on the Idaho Panhandle. Neither of these species is suspected to occur on the Newport portion of the project area. Historical occurrences and specimens are documented for water howellia from the Spirit lake area, north of Rathdrum, Idaho, in 1892 (Shelly 1994). Water howellia is believed to be extirpated from this area; recent surveys have not relocated this plant. Ute's ladies' tresses has never been documented here, although habitat is present. The proposed alternatives will have no cumulative effects on either of these species or their habitat (see Biological assessment). Past activities on federal and non-Federal lands have likely affected habitat for water howellia and Ute's ladies' tresses. Present and reasonably foreseeable activities on federal lands, are likely having no or very low cumulative effects on habitat for these species, as their preferred habitat remaining on federal lands is found in wetland and riparian areas, which are afforded protected under federal laws and internal policies. Present and reasonably foreseeable activities on non-Federal lands are hard to quantify with certainty. Cumulative affects to habitat on non-Federal lands are likely occurring, especially on lands which are being developed and converted to other uses.

Sensitive Plants

At the larger, multiple subbasin scale, the analysis of cumulative affects for sensitive plants is less certain and harder to quantify. There are documented sensitive plants and habitat within subbasins, on federal and non-Federal lands, especially in wet, moist and dry forest habitats that may be affected in any of the alternatives (see chapter III, Sensitive plants). There are more documented occurrences of sensitive plants known for federal lands, mainly because more acres of federal lands have had botanical field surveys (ICDC 1999). Sensitive plant sitings from non-Federal lands have been more incidental, many are historical, and a number are no longer present (ICDC 1999). In general, the quantity, quality and suitability of sensitive plant habitat is higher on federal lands, as it has experienced less development, habitat modification and habitat conversion than non-Federal lands. Through time, as non-Federal lands in the subbasins experience continued urban growth and rural development, federal lands containing suitable habitat will be even more important in the maintenance of sensitive plant populations in the ecosystems. Given current trends, for some populations of certain plant species, the continued existence within the subbasins and their evolutionary potential will depend in a large part on habitat remaining on federal lands.

Prior to the release of the first sensitive plant list (1988) sensitive plants were not addressed in federal decisions, and formal surveying did not occur. Currently, no federal or State laws in Washington or Idaho require non-Federal land owners to survey and manage for sensitive or rare plants. Past activities on federal and non-Federal lands have likely affected habitat for sensitive plants, especially for sensitive plant species found in wet, moist and dry forest habitats. Moist and dry forest habitats are the ones primarily affected to varying degrees by the Douglas-fir bark beetle infestation and the proposed federal actions.

Some sensitive plant populations may be affected from the beetle infestation alone, regardless of the proposed federal actions, especially in areas where a high percentage of canopy would be lost. Of the estimated 24,000 acres currently infested, about 30% would not be treated under any proposed action. Certain sensitive plant species or entire populations could be adversely affected from the increased light levels, change in micro-climate, and increased competition from other understory species. The increased risk of catastrophic wildfires from high fuel loadings resulting from the bark beetle infestation, could also affect populations cumulatively. Incremental decreases in population numbers or entire population losses from stochastic events (like large fires) can, in the long term, increase the likelihood of local extinction. The exact patterns of genetic variation and the affects of decreasing population size is virtually unknown for most sensitive plant species. The ability of populations to recover or to re-colonize suitable habitat depends of the presence and proximity of nearby populations in un-affected patches, the availability and dispersal ability of seed/spores to migrate into an area, and the availability of habitat or niches (often micro-sites) conducive to establishment and persistence of sensitive plants. For example, after fires, sensitive plant species adapted to later successional states may not have suitable habitat available for recolonization for hundreds of years following the event.

Sensitive plant lists vary significantly between the three project areas (see appendix B). The lists for the Newport Ranger District, Colville National Forests and the Priest Lake Ranger District, Idaho Panhandle National Forests only share eleven species in common that may occur in Douglas-fir bark beetle activity areas, out of 46 and 56 total sensitive species, respectively. The sensitive plant list for the Coeur d'Alene District on the Idaho Panhandle National Forests only shares nine species in common with the Newport Ranger District on the Colville National Forest, that may be affected. Within the Idaho Panhandle, there are thirteen species found on both the Priest Lake district and the Coeur d'Alene District that may be affected, out of 63 species listed for the entire Idaho Panhandle National forests.

Between the Coeur d'Alene District, and the Priest Lake/Newport districts, common sensitive plant populations and suitable habitat that may be affected are not connected or contiguous. These are independent populations, with an extremely low to no likelihood of interbreeding, mostly because of the distance between the Coeur d'Alene District and the rest of the project area. The amount of suitable habitat occurring on non-Federal lands between the Coeur d'Alene and Priest/Newport districts is difficult to quantify; however, much has been altered by urban and rural development. These non-Federal lands likely do not contain much suitable habitat that could provide connectivity between suitable habitats within the subbasins for sensitive plants. Within the entire project area, if populations or population segments were lost on the Coeur d'Alene, for example, this could mean a loss to the species as a whole, as these independent populations likely would have unique patterns of genetic variation adapted to the Coeur d'Alene subbasin. The Coeur d'Alene has fewer sensitive plant species, and fewer known occurrences compared to Priest Lake district. Because some of the populations are small, there is an inherent risk from increased inbreeding and erosion of genetic variability due to genetic drift.

For the sensitive plants in common between the Newport and Priest Lake districts, the geographic distance and the affected suitable sensitive plant habitat is in close proximity. These two watersheds are divided by a north to south ridge, generally above 4,500 feet, and some habitats capable of supporting species common to both districts do exist, although very little occurs in areas affected by the beetle infestation. It is likely that populations of some sensitive species found in moist forest habitats on both sides of the divide may periodically interact and interbreed. This pattern has been referred to as a "metapopulation;" populations that are clustered and non-contiguous but that do interact through geneflow and dispersal (in Falk et al. 1996). Metapopulations can be made up of "core" populations that are larger and more stable, and "satellite" populations that are smaller and more temporary in size. In favorable years, individuals may disperse to satellites and establish new populations, while in unfavorable years, populations may only exist in core areas. In large areas, like the Priest and Newport districts, a metapopulation of a sensitive species will have populations that are increasing or decreasing in any point in time. The loss of one local population may be balanced on average by the establishment of new ones. The loss of common population segments or portions of the meta-population, on one district or the other, would at the larger subbasin scale, not be as severe as the Coeur d'Alene situation described above, as long as the net change was zero or positive (populations increasing). When the net change in metapopulation numbers are negative, and core populations are small, at some point populations get so small, that the risk of local extinction is increased, the ability of species to respond to environmental variation is diminished, and local extinction is the probable outcome.

Present and reasonably foreseeable activities proposed on federal lands, including the proposed federal actions under the Douglas-fir beetle EIS, are likely to have a low level of cumulative effects, as populations of sensitive plants are managed to maintain viable populations following federal regulations and policy. Because of survey and mitigation requirements in areas proposed for federal actions, populations found on federal lands will be protected from adverse affects.

Present and reasonably foreseeable activities on non-Federal lands are hard to quantify with certainty. No State or federal laws require non-Federal land owners to specifically address sensitive plant species or habitat. Low to moderate levels of cumulative effects to sensitive plant populations and habitat are likely occurring on non-Federal lands, especially in remaining wet, moist and dry forest habitats. In isolated pockets of suitable habitat occurring on non-Federal lands, that currently contain sensitive plant populations, these

populations will likely be eliminated through time by human disturbance and development, successional processes or chance events. These fragments are isolated from other remaining populations, dispersal of new individuals is unlikely.

Noxious Weeds

For this resource, the effects across the whole project area on the three Districts are not any different than the site effects described in Chapter III by District. The risk of noxious weed spread due to proposed activities is discussed in each District section. Vehicles could import new species into proposed treatment areas and expand existing populations. Weed prevention and treatment practices would minimize but not eliminate the risk of weed spread. Activities occurring on private lands also add to the risk of weed introduction and spread.

Watershed

Across the Douglas-fir project area, substantial improvements will be realized in the action alternatives, especially Alternatives B, C, D, E, and G, because of the amount of watershed work involved. However, due to the wide and dispersed nature of the improvements, and due to the lack of interconnectedness of the streams, the cumulative effects will remain at the local watershed level.

Sediment reduction is most noticeable at localized sites where encroaching roads are removed. Also, removing road stream crossings would improve overall watershed conditions in the small tributaries. At a localized level, overall conditions are expected to drastically improve at the sites that receive this type of restoration work.

The following table displays the primary controlling variables that were tracked by each watershed throughout the Douglas-fir Beetle project area (Coeur d'Alene River, Priest Lake and Newport Ranger Districts).

Table III-303. Projected Watershed Response Status by Alternative.

Measure of Change	Alt. A*	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
net stream crossings (#)	-134	-277	-291	-294	-277	-232	-380
net associated risk (tons/year)	-494	-1341	-1357	-1422	-1340	-1015	-1746
net roads (miles)	-71	-181	-191	-195	-179	-141	-244
net encroaching road (miles)	0	-6.8	-6.8	-7.1	-6.8	-4.8	-8.7

** changes would occur under the No-Action Alternative due to reasonably foreseeable and ongoing activities.*

Definitions of variables

Net Stream Crossings: the change in the number of inventoried stream crossings in the project area compared to the existing (present) conditions. New road construction or reconstruction of roads without culverts can add to the net value. Road or crossing obliteration or conversion to fords will reduce it.

Net Associated Risk: the risk of annual sediment production was calculated in the analyses at inventoried road crossings. Crossings that will be upgraded, fitted for safe overflow, or crossings that are eliminated will reduce net risk based on the chance of failure and the magnitude of failure.

Net Roads: the relative miles of road following implementation of each alternative as compared to present (existing condition). The net value can increase with new construction of permanent or temporary road. The value can decrease with the stabilization of road tread to a "hydrologically inert" status.

Net Encroaching Road: Certain roads that are encroaching on stream channels or their active flood prone areas were inventoried. Such roads are a source of sediment, cause adverse hydrologic effects in the stream, and inhibit channel recovery from disturbances. The net value will decrease when a road segment is eliminated or rendered hydrologically inert.

Soil Productivity

For this resource, the effects across the whole project area on the three Districts are not any different than the site effects described in Chapter III by District.

Fisheries

The effects to fish between the Priest/Newport and Coeur d'Alene are independent. The independence of these two action is supported by their relative location. At their closest point, they are greater than 25 air miles apart. In addition to being separated spatially, these two project areas are also separated hydrologically. One of the two planning areas is in the Pend Oreille River Watershed while the other is in the Spokane River Watershed. Inasmuch as these projects are designed not to have a significant effect at the scale of the planning area, there will be no significant cumulative effects approximately 150 miles downstream where these two watersheds eventually join in the Columbia River Watershed. While the Priest and Newport project areas are closer, the effects to fish are disconnected by Albeni Falls Dam. Because of this dam fish passage is limited between upstream and downstream segments and there are no cumulative effects to fish between the two projects.

Fuels and Fire Behavior

The effects of 100 years of past human activity on inland forested ecosystems has resulted in a significant change from historic patterns and is indicative of unhealthy ecosystem conditions. Timber harvesting began in the 1890s. By 1900 a major portion of mature ponderosa pine stands had been harvested and either converted to other uses or were regenerating to dense, often mixed species stands. Prior to 1960 many upland areas were high-grade logged removing only the valuable species, resulting in major stand conversions to grand fir, hemlock, and Douglas-fir. Since the late 1930s, fire control efforts have become effective. The primary impact of fire control has been to eliminate underburns and mixed severity fires which served as the thinning agents that favored larch and ponderosa pine. In 1909 white pine blister rust was accidentally introduced to western North America. This Eurasian disease devastated white pine forests (Zack 1995).

Because of this change in species composition and structure, low and mixed severity fires are now an improbable occurrence in many forests; severe stand replacing fires are more likely. The no action alternative takes no steps to interrupt this trend. Action alternatives propose prescribed burning to reduce fuel accumulations and reintroduce seral species (ponderosa pine, white pine and larch) and make progress towards reducing potential intensities and severities of wildfire in beetle infested areas. Even with this treatment, untreated areas and areas treated with salvage harvest will continue to trend toward conditions that favor potential high intensity wildland fires.

It is unlikely that there would be any cumulative effects for potential increased fire intensities or severity on the Coeur d'Alene District due to beetle activity on the Priest Lake or Newport Districts. The closest areas with Douglas-fir beetle infestations on the Priest Lake and Newport districts are located approximately 35 miles to the northwest of any affected areas on the Coeur d'Alene. The predominant wind direction within

the area is from the southwest, so most large wind driven fires are pushed to the northeast (fire history maps, Fuels/Fire portion of project file). Even severe fire seasons such as the 1910 fires that swept across the St. Joe and Coeur d'Alene Forests passed to the east of Priest Lake and Newport (USDA 1978). There is one wind driven fire on record that did burn in a northwest/southeast pattern between Sullivan Lake and Priest River in the 1920s. However, with the development in the valleys separating Coeur d'Alene from Priest Lake and Newport, it would be an unlikely event now. It is also unlikely that there would be any cumulative effects for potential increased fire intensities or severity on the Priest Lake or Newport Districts due to beetle activity on the Coeur d'Alene District, because of the same wind pattern and human development.

It is likely that there would be cumulative effects for potential increased fire intensities and severity between the Newport District and the Priest Lake District due to beetle activity on either districts. During severe fire seasons such as 1910, fires that started north of Spokane swept across the Pend Oreille River and into the Priest River basin (USDA 1978). However, it is less likely that there would be cumulative effects for potential increased fire intensities and severity between the two districts due to beetle activity on the Priest Lake District, since the predominant wind direction would push most fires in the Priest River Basin to the northeast and away from Newport. Smaller fires are controlled more by fuel, terrain, and local wind patterns, and have a history of burning to the divide from both sides and involving areas within both river basins (IPNF, fire records project file).

Air Quality

Smoke from burning will be produced as discussed in project area effects analyses earlier in this Chapter. Timing and dispersal of smoke is coordinated with State agencies to meet standards at a larger cumulative effects boundary. Activities such as agricultural field burning, other forest residue burning, residential wood stove use, motor vehicle produced exhaust and dust, and dust from the Palouse and Columbia basin all produce pollutants that contribute to the degradation of air quality. The Forest Service voluntarily ceases burning operations to avoid violations of State standards.

The Fuels and Fire Behavior section above addresses the cumulative impacts between Coeur d'Alene, Priest Lake and Newport Districts regarding potential wildfire. Smoke from potential wildfires would follow the same discussion.

Wildlife

Cumulative effects to wide ranging wildlife can be viewed at several different, and successively larger, scales. This project has been evaluated at the stand, subdrainage (analysis area) and subbasin (project area) scales. The larger area that encompasses the three separate project areas (Coeur d'Alene, Priest Lake and Newport) represents a portion of a physiographic area in the next hierarchy of landscape units. The goal at this scale is to maintain persistence of the metapopulation which consists of an aggregate of interacting subpopulations. Subpopulations are usually separated by semipermeable barriers (e.g. major waterways, human developments, and major highways) or isolated by geographic distance alone. Each separate project area represents subpopulations that contribute to the viability of the much larger population (metapopulation).

The Coeur d'Alene River project area is separated or isolated from the Priest Lake and Newport projects by a large distance and by semipermeable barriers. These semipermeable barriers are the Highway 2 corridor (including the Burlington-Northern railway and Pend Oreille River), the Highway 95 corridor (including the Burlington-Northern railway) and extensive rural development between projects. It is highly unlikely that there would be an interchange of individuals of species that are common between project areas because of the distance, development, and barriers. Bird species analyzed (flammulated owl, white-headed woodpecker, goshawk) have home range sizes that would preclude use between these areas except possibly during migration. There would be no additive or cumulative effects between the Coeur d'Alene and the

Priest/Newport projects. Each individual project would maintain connectivity within associated landscapes so as not to prevent dispersal, should it occur.

On the other hand, the Priest Lake and Newport project areas share a common boundary, separated by a major ridge system of the Selkirk Mountains. It is expected that there would be some interchange of species between these two project areas, especially for those species that are wide-ranging and have home range areas large enough to overlap, and species that occur at higher elevations. Grizzly bear, gray wolf, wolverine, fisher and lynx are species common to both projects and are most likely to move between project areas. Goshawk, flammulated owl and white headed woodpecker habitats generally occur at lower elevations and would not be moving across the Selkirk mountain divide between the two project areas. Species that reside at the higher elevations and along the divide, such as blue grouse and boreal owl occur outside the project area and would not be affected. It is expected that the Douglas-fir beetle project would maintain the connectivity of habitats, thus, allowing for the continued movement of species between the Priest Lake and Newport projects.

The primary wildlife issues that are common between projects for these species are security including winter, (reducing species mortality risk and providing effective use of available habitats) and the perpetuation of old forest structure. Old forest structure provides important habitat to a wide variety of species including denning habitat for fisher and lynx, and nesting habitat for goshawk and flammulated owl. Fire risk and prey abundance are also important factors.

The combined area would reduce open road densities and improve road closure effectiveness to control motorized access, including snowmobiles. This would create safer, more secure environment for such wide-ranging species as lynx, grizzly bear and fisher.

The loss of old forest structure from historical levels, particularly old growth, has been the most significant forest structure change. Also, there has been a major shift in forest tree species and composition over the last century that has had implications on maintaining old growth on the landscape. Douglas-fir and other shade tolerant species have replaced sites once dominated by western white pine, western larch and ponderosa pine. In this area, Douglas-fir is a relatively short lived species due to its susceptibility to insect and disease infestations and fire. Consequently, a landscape dominated by Douglas-fir is unlikely to return to historic levels of old growth. These projects would promote changes in forest tree species and composition that would trend toward historic vegetative patterns and encourage the long term continuation of old forest structure. These projects would protect and maintain existing old growth stands.

A risk to the amount and distribution of important habitats is lethal fires. The extent of the beetle outbreak has accelerated the trends toward higher fire intensities and severities. Treating created fuels would breakup the continuity and reduce intensities and severities of lethal fires, resulting in a higher probability of retaining old forest structure and other habitats across the treated landscapes.

Prey species abundance would be maintained in all project areas.

The combined effects of the two project areas are not any greater than the effects discussed for each individual project area, therefore species effects determinations would remain the same and population viability would be maintained for all species.

Recreation Cumulative Effects

The primary measure of cumulative effects of action alternatives applied to the three Ranger Districts simultaneously would be the potential to displace recreation activities to other public or private lands or to eliminate recreation opportunities as described in the Affected Environment/Existing Condition section of this document.

Operations simultaneously occurring in the Coeur d'Alene, Newport and Priest Lake Ranger Districts would not cause a significant displacement of recreation users or activities. Each District offers ample settings for recreation users to move to areas not impacted by active timber operations. Collectively, the Districts maintain a wide diversity of recreation opportunities and areas free of direct impacts of various proposed management activities. There would not be a significant displacement of activities or conflicts between recreationists created by management actions on public or privately owned lands.

Scenery Cumulative Effects

The three Ranger districts are geographically separated to such a great extent that the effects upon scenery of the proposed action alternatives are not noticed as being related. Intervening between the Coeur d'Alene River Ranger District, Priest Lake Ranger District and the Newport Ranger District are landscapes that are urbanized, rural, natural appearing and pristine appearing. The proposed actions on the districts cumulatively, would be completely integrated into the large variety of human-manipulated landscapes that make up the region.

Heritage and Tribal Interests Summary

For this resource, the effects across the whole project area are not any different than the site effects described in Chapter III by each District. A large portion of the Douglas-fir beetle project area has been inventoried previously for heritage resources. The known historic properties in the project area have been identified and considered in the development of project alternatives. Consultation is continuing with the State Historic Preservation Offices. Areas not previously inventoried will be inventoried and findings also reported to State Historic Preservation Officers for the two states.

We have consulted with the Kalispel Tribe and the Coeur d'Alene Tribe on the project. Additional consultation would occur throughout the life or the project as necessary.

Finances Summary

The volume of timber that would be harvested in the proposed timber sales are within the range of previous timber programs on the Colville and Idaho Panhandle National Forests, and is therefore not expected to have an unusual impact on the local timber market, including not causing a decrease in the timber prices that other landowners might receive for their beetle damaged or killed timber.

ADVERSE EFFECTS WHICH CANNOT BE AVOIDED

Vegetation

The Douglas-fir beetle is expected to cause dramatic changes in structure in some stands, but in most stands the beetle will create small openings only. Natural regeneration in openings will tend towards shade-tolerant species after going through a prolonged shrub stage initially.

There is expected to be some reduction in the mature/large timber and the small/medium sawtimber structural stages as a result of the bark beetle attacks.

Sensitive Plants

Some sensitive plant populations may be affected by removal of the forest canopy by beetle attack.

Noxious Weeds

Any activity has a risk of introducing and spreading weeds. Vehicle use and travel associated with timber harvesting, road construction and other actions will increase the risk of spread. Mitigation measures such as washing vehicles and closure of temporary roads will help reduce but not eliminate the risk of weed spread due to proposed activities.

Watershed, Soil Productivity, and Fisheries

Watershed restoration activities as well as road building for timber harvest would create sediment that would reach some stream systems, but Best Management Practices and use of buffers around streams would reduce the effects to a minimal level.

Compaction, displacement and severe burning affect soil physical, chemical and biological properties which can indirectly affect growth and health of trees and other vegetation. Some soils will be compacted during timber harvesting, however FSM guidelines (Regional Supplements, for both R1 and R6 to the FSM 2500) specify that no more than 20 percent of an activity area will be compacted, puddled, or displaced, including roads and landings. Mitigation measures are designed so that activities meet these guidelines. Soils that are recognized with existing compaction near or over Forest Plan standards would be treated with a winged subsoiler to decrease soil compaction.

Fuels and Fire Behavior

Under the No Action alternative, the prolonged buildup of fuel may lead to fires more catastrophic and destructive to the site than typically occurred in the native forest. The combination of more fine fuels such as grasses and shrubs regenerating in openings, new understory trees serving as ladder fuels, and continuing accumulation of heavy fuels from down logs and snags all contribute to changes in fuels and towards more severe fire behavior, which in turn threaten future fire control and place neighboring forest ecosystems at risk.

The fuel conditions that enable a fast moving wildfire of higher than normal intensity could persist for several decades. One negative impact from the No Action Alternative is the amount of snags created and the danger to firefighters. Further discussion of these effects and risk are outlined in the Chapter III effects discussion.

Air Quality

The prescribed burning of slash, and prescribed fires would cause a temporary deterioration in air quality.

Wildlife

The reconstruction of impassable roads would increase the opportunities for foot traffic and some snowmobile use, thereby, increase the vulnerability of some species to hunting and trapping. This would last until such time they become revegetated. Within 5 years road densities will be reduced due to timber sale contract required work and funded work to close, obliterate or otherwise remove roads

Removal of dead Douglas-fir trees would reduce the amount of trees and snags available to some wildlife species, especially primary cavity excavators, however, the levels of snag and green replacement trees left would mitigate this adverse effect. Some wildlife species would be displaced/disturbed during periods of human activity in action alternatives.

The harvesting of trees would result in a direct loss of reproduction of some nesting birds.

Recreation and Scenery

There would be a visual impact in the short term in alternatives that enter the Hayden Lake area with regeneration harvest, while improved stand structure and species composition would result in the long term. Construction and reconstruction and closure of roads would temporarily affect aesthetics, erosion, wildlife and public uses of the area.

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Short term uses are generally those that determine the present quality of life for the public. Current activities must not significantly impair the long-term productivity. Long-term productivity of the land refers to the capability of the land to provide resources such as forage, timber and high quality water.

Vegetation

The capability of the land to produce forage, timber and high quality water would not be impaired by the action alternatives. By substituting early seral species that were previously found on these sites, for the Douglas-fir currently predominating, the diversity of the vegetation would trend toward the historical level. The vegetation resilience to disturbances such as fire, insects and disease is increased.

Watershed, Soil Productivity and Fisheries

As a result of watershed improvement activities, there would be an increase of sediment during the activity but the project may reduce long term sediment to the river system. The long term benefits of the watershed improvement work would reduce the total potential volumes of sediment entering the stream channels and provide for better channel morphology and floodplain connectivity.

The removal of roads in riparian areas has the short term effect of removing streamside vegetation associated with the road fill, but the long term benefit is to provide for a more natural channel condition, and better fish habitat elements.

Over the long term, habitat conditions for fisheries would begin to improve so that fish populations can begin to increase. The reason for this trend toward recovery is the watershed restoration work done. Removal of culverts that are barriers to fish passage and removal of encroaching roads would increase sediment delivery to streams in the short term. However, the long term benefit would be utilization of more habitat by fish and perhaps reconnecting isolated stocks of fish. Habitat complexity and large wood recruitment into streams would improve over time as obliterated roads regenerate to riparian vegetation and forested cover.

Fuels and Fire Behavior

Timber harvest under the Action Alternatives can significantly affect both short and long-term fuel loading. Timber harvest moves unavailable aerial fuels (tops, stems, limbs, needles) into available surface fuels. Thus the risk of a crown fire may be reduced while the risk of surface fires can be increased by moving fuel to the ground. An increased fire hazard and risk of ignition from ground activities such as recreation camping, vehicles, recreational hiking, and machinery used in timber harvest may result. Treatments outlined in the mitigation measures such as lopping and scattering of fuels, piling and burning, and construction of fuelbreaks in the created fuels can reduce some ignition risk and improve our ability to control fire.

Air Quality

The potential for air quality degradation and reduced visibility increases with Alternative A, No Action. Existing and increased tree mortality increases the intensity of wildfire. A wildfire under normal summer conditions could prove difficult to control. Consumption of increased fuel loads and understory biomass would increase the amount of smoke emissions. These emissions may remain in the local and surrounding airsheds for a period of a few days to several weeks depending on the fire's size and intensity.

Under the action alternatives, the Forest Service would voluntarily cease burning activities to avoid violations of State standards. Burning of fuels under prescription would occur primarily in early spring when demand for airspace has been historically low. Activities such as agricultural field burning, other forest residue burning on private lands, residential wood stove use, motor vehicle exhaust, and dust input from the Palouse and Columbia basin are competing uses of the monitored airspace.

Wildlife

The need for large size snags for cavity nesters, perches, as well as down logs for use in hiding, denning and forage by other wildlife species over the long term, has to be weighed against the increased fuel loading presented by leaving dead standing material or down wood. The amounts of snags to be left in the action alternatives follow a protocol based on the best available information on what sizes, numbers and types of snags are needed for wildlife, that can be protected through contract activities. The short term need for protection from destructive wildfire and reduction of fire risk has been addressed by fuels treatment proposals in the action alternatives.

The disturbance to wildlife and loss of security would be minor and short term due to roads being opened to implement the project that are currently closed. These roads will be restricted to administrative use only.

IRREVERSIBLE AND IRRETRIEVABLE EFFECTS

Irreversible effects describe the loss of future options, these apply primarily to effects of using nonrenewable resources such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods of time. Irretrievable effects apply to loss of production, harvest or use of natural resources. The production lost is irretrievable , but the action is not irreversible. If the use changes, it is possible to resume production (from FSH 1909.15-92-1, Definitions section 05).

Vegetation

The loss of production, harvest or use of natural resources can be considered an irretrievable loss. A low level of harvest of beetle killed trees in an alternative, could be increased under future decisions and analysis, but the Douglas-fir material killed now would not be available in the future for harvest and that output would be "lost."

An estimated time for loss which voids the value for harvest would be approximately 2-3 years following mortality of the trees. Refer to the discussion on deterioration of wood and value in the effects discussion in Vegetation.

Watershed, Soil Productivity and Fisheries

There would be minor nutrient losses as a result of burning piles for fire hazard reduction and from wood removed from the site. Harvesting the tree bole as a log will remove about 14 percent of the potassium contained within the tree, which may have an indirect effect on some plants. Potassium is recycled from the soil through the green vegetation and is not added to the tree ecosystem by rainfall, air, or other inputs. Effects of removing Douglas-fir logs from low potassium soils are not entirely understood. Until monitoring is completed, it is unknown what amount is lost by removal of the logs. The loss could be termed an irreversible loss due to the non-renewability of the resource. Mitigation measures would limit this removal by retaining much of the fines and small stem material to overwinter on site.

The risk of high severity wildfire that could consume soil organic matter goes up as the fuel loadings increase from beetle mortality. Such a fire would be predicted to have a moderate to high effect on soil nutrient and soil structure loss. This could result in reduced tree seedling establishment, tree growth, and insect and disease resistance.

Road building is an irreversible commitment since roaded templates can only be restored to a non-roaded condition after a long period of time or after ripping and revegetating.

Fuels and Fire Behavior

Without fuels treatment on sites and restoration of seral species, the chances increase that in appropriate weather, when wildland fires do occur, their intensities and severity could be higher than historic fires. These large and hot fires could result in soil damage through loss of stored nutrients, loss of organics, and reduction of infiltration; with an accompanying loss in potential soil productivity.

Wildlife

Building roads and maintaining them on the landscape removes them from a productive status for wildlife habitat.

Regardless of alternative selected, some allocated and recruitment old growth would be lost to Douglas-fir beetle outbreak.

CONFLICTS WITH LAND PLANS

The continued succession of fuels, mortality from insects and disease, and the exclusion of fire or fuels treatments under Alternative A may create areas where fire behavior characteristics will exceed the goals, objectives and standards established in the Forest Plans.

Several prescribed fire units in Newport Alternative G may not be consistent with the Colville NF Forest Plan for big game cover-forage ratios within winter range.

Under Alternatives B, D and E the Bumblebee Analysis Area on the Coeur d'Alene River Ranger District does not meet water quality standards, because there are no effective restoration actions proposed within the beetle-infested areas to offset the increased risk of installing culverts on an existing road, or a temporary spur road. It can not be adequately demonstrated that the alternatives would avoid contributing to the pollutant that caused a water quality limited segment to be listed (303d).

OTHER REQUIRED DISCLOSURES

Effects to consumers, minority groups, women, civil rights, and Environmental Justice

There would be minimal impacts to consumers. The amounts of wood fiber put on the market would not increase mill production, because the timber offered for sale would be replacing sales of non-beetle infested timber which would have otherwise been offered for sale during the lifetime of this project.
Minority groups would not be affected by any action alternative and no groups would be disproportionately impacted (environmental justice). Effects of various levels of timber harvest activities and watershed restoration work are concentrated on National Forest System lands. There would be no effects to women or civil rights. All contracts offered by the Forest Service contain Equal Employment Opportunity requirements.

American Indian Religious Freedom Act

No effects are anticipated to the American Indian Religious Freedom Act. No impacts on American Indian social, economic or subsistence rights are anticipated.

Prime Farmland, Rangeland or Forestland

None of the activities proposed would adversely impact prime farmland or rangeland. National Forest System lands are not considered prime forestland.

Effects to floodplains and wetlands

The Inland Native Fish Strategy (INFS) standards and guidelines implemented with this project would protect floodplains and wetlands.

Some beneficial effects are expected for floodplains from the proposed watershed improvement work, especially related to the removal of encroaching roads. Please see Watershed sections in Chapter III for more information.

Incomplete or Unavailable Information

Specific knowledge of population biology and autecology of some plant species is lacking. Refer to discussion in Threatened, Endangered and Sensitive Plant sections of Chapter III.

The effect of removing Douglas-fir logs off low potassium soils is not well addressed in the literature. A reasoned analysis of scope of these soil types within the project area and the existing credible scientific evidence is disclosed in the Soil Productivity analysis of effects in Chapter III. Adverse impacts have been evaluated and disclosed. In conjunction with the most recent research by the Intermountain Forest Tree Nutrition Cooperative, mitigation measures were developed. These represent the state-of-the-art recommendations.

ACRONYMS/GLOSSARY

Acronyms

ATV	All-terrain vehicle
BA	Basal Area
BACT	Best Available Control Technology
BEHAVE	Fire Behavior Model
BF	Board foot*
BMP	Best Management Practices*
CCF	Cunit (hundred cubic feet)*
CDA	Coeur d'Alene
CFR	Code of Federal Regulations*
CNF	Colville National Forest
cfsm	Cubic feet per second per square mile (referring to water flow)
COR	Contractor's Officer Representative
dbh	Diameter at breast height
DEIS	Draft Environmental Impact Statement
DEQ	Department of Environmental Quality
DF	Douglas-fir
EAWS	Environmental Assessment at the Watershed Scale
ECA	Equivalent Clearcut Acres
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FAR	Functioning at risk (referring to watersheds)
FEIS	Final Environmental Impact Statement
FFE	Fire and Fuels Extension
FOFEM	First Order Fire Effects Model
FPA	Forest Practices Act
FSH	Forest Service Handbook
FSM	Forest Service Manual
FVS	Forest Vegetation Simulator
GA	Geographic Assessment
GAO	Government Accounting Office
ICBEMP	Interior Columbia Basin Ecosystem Management Project
IDL	Idaho Department of Lands
IDT	Interdisciplinary Team*
IFPA	Idaho Forest Practices Act
IFTNP	Intermountain Forest Tree Nutrition Cooperative
INFS	Inland Native Fish Strategy
IPNF	Idaho Panhandle National Forests
KV	Knutson-Vandenburg Act of 1924
LP	Lodgepole pine
MA	Management Area*
MBF	Thousand Board Foot
MMBF	Million Board Foot
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act*
NFMA	National Forest Management Act
NFS	National Forest System
NPFC	Not properly functioning condition (referring to watersheds)
PFC	Properly functioning condition (referring to watersheds)
PM	Particulate Matter
PP	Ponderosa pine
PWC	Public works contract
Q2	level of instantaneous discharge expected to occur on average of every 2 years (referring to watershed conditions)
Q50	level of instantaneous discharge expected to occur on average of every 50 years (referring to watershed conditions)
R1	Region 1--the Northern Region of the Forest Service
R6	Region 6--the Pacific Northwest Region of the Forest Service
RD	Ranger Distrcit
RHCA	Riparian Habitat Conservation Area*
RMO	Riparian Management Objective
ROD	Record of Decision
RPA	(Forest and Rangeland) Renewable Resources Planning Act
SAF	Subalpine fir
SAM	Sale area map
SCA	Stream Channel Alteration (Act)
SMU	Streamside Management Unit
SMZ	Streamside management Zone*
SPCC	Spill Prevention Control and Countermeasure
SPS	Special project specifications
SWCP	Soil and Water Conservation Practices
TES	Threatened, Endangered and Sensitive
TMDL	Total Maximum Daily Load
TML	Timber Marginal Lands
TSA	Timber Sale Administrator
TSC	Timber Sale Contract
TSI	Timber Stand Inventory
TSP	Total Suspended Particulate
WBP	White-bark pine
WDNR	Washington State Department of Natural Resources
WH	Western hemlock
WL	Western larch
WP	White pine
WQLS	Water Quality Limited Stream
WRC	Western redcedar
WSDFW	Washington State Department of Fish and Wildlife
WSDOE	Washington State Department of Ecology

* *These terms are defined in the Glossary below.*

Glossary

A

Activity Fuels. The residue left on the ground after human-caused disturbances.

Aesthetics. Generally, the study, science, or philosophy dealing with beauty and with judgments concerning beauty. In scenery management, it describes landscapes that give visual and sensory pleasure.

Affected Environment. The natural, physical, and human-related environment that exists at the time of the analysis.

Age Class (Scenery/Visual definition). An age grouping of trees according to an interval of years, usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1 - 20 years or 21 - 40 years.

Air Quality. Refers to standards for various classes of land as designated by the Clean Air Act, P.L. 88-206: Jan. 1978

Airshed. A geographical area that, because of topography, meteorology, and climate, shares the same air.

Alluvial. Materials transported and deposited by water.

Area Transportation Plan. A plan that identifies the transportation facilities needed to manage the lands and resources for a given area.

Armoring. Protective coverings or structures used to displace the erosive force of water. Rip-rapping is a type of armoring.

Aspect. The direction a slope faces. For example, a hillside facing east has an eastern aspect.

B

Background (Visual Distance Zone). That part of a scene, landscape, etc., which is furthest from the viewer; The distant part of a landscape. The IPNF defines background as the landscape area located from three miles to infinity from the observer. The Newport Ranger District defines background as the landscape area located from 4 miles to infinity from the viewer.

Basal Area. Area of the cross section of a tree stem near the base, generally at breast height and inclusive of bark.

Baseline Data. Data representative of a particular base period or concurrent control sample. Normally representative of the undisturbed, undeveloped state.

Best Management Practices (BMP). Practices determined by the State to be the most effective and practicable means of preventing or reducing the amount of water pollution generated by non-point sources, to meet water quality goals.

Big Game. Those species of large mammals normally managed as a sport-hunting resource.

Biodiversity or Diversity. The relative distribution and abundance of different plant and animal communities and species within an area.

Biomass. Total weight or quantity of organic material on a given area over a defined period.

Biophysical Settings. The Newport Ranger District defines biophysical settings as areas with similar vegetation characteristics, fire frequencies, moisture regimes and geological and topographical characteristics. The Newport Analysis Area has five biophysical settings: BS #3 - Douglas-fir/grand fir with tall shrubs; BS #5 - Douglas-fir/grand fir with huckleberry; BS #7 - subalpine fir with forbs and shrubs; BS #11 - western redcedar/western hemlock with forbs and shrubs; and BS #12 - western redcedar/western hemlock on moist bottomlands.

Board Foot (BF). A unit of measurement equal to an unfinished board one foot square by one inch thick.

Broadcast Burn. See Prescribed Burning.

C

Canopy. More or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth. In terms of scenery or visuals, it refers to the part of any stand of trees represented by the tree crowns, usually the uppermost layer of foliage, but it can be used to describe lower layers in a multi-storied forest.

Canopy Closure. The amount of ground surface shaded by tree canopies, as seen from above. Used to describe how open or dense a stand of trees is, often expressed in percent.

Capable Habitat. Wildlife habitat that has the fixed attributes that enable it to produce the habitat requirements for a given species currently or in the future. These fixed attributes are usually soils (or parent material, or landtype), slope, aspect, elevation, and habitat type. The vegetation on the site may not be currently suitable for a given species because of variable stand attributes such as inappropriate seral stage, cover type or stand density. See also Suitable Habitat.

Cavity Habitat. Snags, broken-topped live trees and down logs used by wildlife species that excavate and/or occupy cavities in these trees.

Characteristic. When used in terms of scenery or visuals, this refers to the qualities that constitute a character, that characterize a landscape; a distinguishing trait, feature, or quality; uniqueness; or attribute.

Clearcut Harvest. A stand in which essentially all of the trees have been removed in one operation. Depending on management objectives, a clearcut may or may not have reserve trees left to attain goals other than regeneration.

Climax Vegetation. The culminating stage in plant succession for a given habitat, that develops and perpetuates itself in the absence of disturbance, natural or otherwise (in temperate ecosystems this rarely occupies large portions of the natural landscape because of the frequency of natural disturbances).

Code of Federal Regulations (CFR). The listing of various regulations pertaining to management and administration of the National Forests.

Color. The property of reflecting light of a particular wavelength that enables the eye to differentiate otherwise indistinguishable objects. A hue (red, green, blue, yellow, and so on), as contrasted with a value (black, white, or gray).

Conifer. Any of a group of needle and cone-bearing evergreen trees.

Contract Provisions. Controls constraints, and/or general direction included in Contracts offered by the Forest Service.

Contrast. A term used in regard to scenery or visuals, referring to the diversity or distinction of adjacent parts, or the effect of striking differences in form, line, color, or texture of a landscape.

Contour map feature. A term used in regard to scenery or visuals, referring to a line drawn on a map that connects points of the same elevation.

Corridor. A term used in regard to scenery or visuals, referring to a clearing made by a skyline logging system.

Council on Environmental Quality (CEQ). An advisory council to the President, established by NEPA. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Cover. Vegetation used by wildlife for protection from predators, adverse weather conditions, or in which to reproduce. The different types are identified as hiding cover, thermal cover, and security areas.

Cover/Forage Ratio. The ratio, in percent, of the amount of area in cover conditions to that in forage conditions.

Created Opening. A term used in regard to scenery or visuals, referring to an opening in the forest cover created by the application of even-aged silvicultural practices.

Cross Drain/Ditch. A man made ditch or channel constructed to intercept surface water runoff and divert it before the runoff concentrates to erosive volumes and velocities.

Crowning. Forming a convex road surface which allows runoff to drain from the running surface to both sides of the road prism.

Cultural or Heritage Resources. The physical remains of human activity (artifacts, ruins, burial mounds, pertroglyphs, etc.) having scientific, prehistoric, or social values.

Cultural Landscape. A term used in regard to scenery or visuals, referring to human-altered landscapes, especially those slowly evolving landscapes with scenic vegetation patterns or scenic structures. Addition of these elements creates a visually pleasing complement to the natural character of a landscape.

Cumulative Effect. The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonFederal) or person undertakes such other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.

Cunit (CCF). One hundred cubic feet. A measurement for timber volume.

D

Decommissioning. Refers to road obliteration. Partial obliteration includes removal and recontouring of all stream crossings and, as needed, recontouring of unstable fill slopes, cutslope stabilization, ripping the road tread, installation of no-maintenance cross ditches, and revegetation. Full obliteration includes removal of all stream crossings and full recontouring of the entire road prism, introduction of woody debris, and revegetation as needed.

Degraded Watershed. A basin which has suffered environmental damage, resulting in accelerated soil or vegetative loss or chemical contamination to the quantifiable detriment of other resources.

Designated Streams. A stream or portion of a stream identified as warranting special consideration in management decisions and project activities. See also Stream or Streamcourse.

Desired Future Condition. The combination of desirable attributes to be attained in the future through management of the national forest.. For scenery management, desired future condition is comprised of interrelated components, including desired travelways, desired use areas, desired landscape character and desired scenic condition.

Desired Landscape Character. A term used in regard to scenery or visuals, referring to the appearance of the landscape to be retained or created over time, recognizing that a landscape is a dynamic and constantly changing community of plants and animals. Combination of landscape design attributes and opportunities, as well as biological opportunities and constraints.

Developed Recreation. Recreation dependent on facilities provided to enhance recreation opportunities in concentrated use areas. Examples are ski areas, resorts and campgrounds.

Dispersed Recreation. Recreation that occurs outside of developed recreation sites; requiring few, if any, facilities or other improvements. Includes such activities as hunting, hiking, viewing scenery and cross-country skiing.

Distance Zones. Landscape areas denoted by specified distances from the observer. Used as a frame of reference in which to discuss landscape attributes or the scenic effect of human activities in a landscape (Immediate Foreground, Foreground, Middleground, and Background).

Distinctive. Refers to extraordinary and special landscapes. These landscapes are attractive, and they stand out from common landscapes.

Disturbance. An event, either natural or human induced, that causes a change in the existing condition of an ecological system.

Dominance Elements. In scenery management, the dominance elements are form, line, color, and texture. They are the attributes that make up the landscape character.

Dominant Human Alterations. In scenery management, dominant human alterations override the natural character of the landscape and are very noticeable.

Down or Downed Wood. A tree or part of a tree that is dead or dying and is laying on the ground.

E

Ecosystem. The organisms of a particular habitat together with the physical environment in which they live; a dynamic complex of plant and animal communities and their associated environment.

Ecosystem/Wildlife Burning. This is the application of prescribed fire to fire-dependent ecosystems in order to meet multi-resource objectives (for example, to improve forage habitat for wildlife).

Ecosystem management. Using an ecological approach to achieve the multiple-use management of national forests and grasslands by blending the needs of people and environmental values in such a way that national forests and grasslands represent diverse, healthy, productive and sustainable ecosystems.

Edge. The line where an object or area begins or ends. Edge serves to define borders, limits or boundaries. In this analysis, edge often refers to where plant communities meet or where successional stage or vegetation conditions within the plant community come together.

Effects (or impacts). Environmental consequences (the scientific and analytical basis for comparison of alternatives) as a result of a proposed action. Effects may be either direct, which are caused by the action and occur at the same time and place; indirect, which are caused by the action and are later in time or farther removed in distance; but are still reasonably foreseeable, or cumulative.

Endangered Species. Any plant or animal species which is in danger of extinction throughout all or a significant portion of its range. (Endangered Species Act of 1973).

Endemic. The population of plants, animals, or diseases that are at their normal, balanced level, in contrast to epidemic.

Ephemeral Streams. Streams that flow only as a direct response to rainfall or snowmelt events. They have no baseflow.

Epidemic. The population of plants, animals, or diseases that are widely prevalent, and exceed their normal, balanced level, in contrast to endemic levels.

Erosion. Detachment or movement of soil or rock fragments by water, wind, ice, or gravity. Accelerated erosion is much more rapid than normal, natural, or geologic erosion, primarily as a result of the influence of activities of people, animals, or natural catastrophes.

Evident. That which is noticeable, apparent, conspicuous, or obvious.

Existing Scenic Integrity. Current state of the landscape, considering previous human alterations; existing visual condition.

Expected Image. A term used in regard to scenery or visuals, referring to a mental picture of what a person expects to see in a national forest.

F

Feature. A visually distinct or outstanding part, quality, or characteristic of a landscape.

Floodplain. The lowland and relatively flat areas during adjoining inland waters that are covered by its waters during flooding.

Forage. Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Forage Areas. Vegetated areas with less than 60 percent combined canopy closure of tree and tall shrubs (greater than seven feet in height).

Foreground (Visual Distance Zone). That part of a scene, landscape, etc., which is nearest to the viewer, and in which detail is evident. The IPNF defines foreground as the landscape area located from one-quarter to one-half mile from the observer. The Newport Ranger District defines foreground as the landscape area located from the observer to one-half mile away.

Forest Cover Type. A category of forest usually defined by its dominant vegetation, based on percentage cover of trees (see Timber Type).

Form. Structure, mass, or shape of a landscape or of an object. Landscape form is often defined by edges or outlines of landforms, rockforms, vegetation patterns, or waterforms, or the enclosed spaces created by these attributes.

Frame of Reference. An area or framework against which various parts can be judged or measured.

Fry. Recently hatched fish.

Fuelbreak. A strategically-located strip or block of land where the fuel is modified to reduce fire intensity potential. Fuelbreaks are designed to interrupt the continuity of heavy, hazardous fuel so fires burning to them can be readily controlled. They are pre-attack installations that provide safer, easier, and faster control efforts for fighting fire. Generally, this treatment provides holding area and accessibility for fire-suppression forces and reduces potential fire damage to adjacent resources.

Fuels. Combustible materials present in the forest which contribute to the intensity of a fire.

Fuels Management. Manipulation or reduction of fuels to meet Forest protection and management objectives while preserving and enhancing environmental quality.

G

Group Selection. A method of regenerating uneven-aged stands in which trees are removed and new age classes are established, in small groups.

H

Habitat Type. (Vegetation). An aggregation of all land areas potentially capable of producing similar plant communities at climax.

Hardwoods. A conventional term for the wood of broadleaf trees.

Hazardous Substance. Materials which by their nature are toxic or dangerous to handle or dispose of, such as radioactive materials, petroleum products, pesticides, chemicals and biological wastes.

Hiding Cover. Vegetation capable of hiding 90 percent of a standing adult deer or elk at 200 feet or less. Includes some shrub stands and all forested stand conditions with adequate tree stem density or shrub layer to hide animals. In some cases, topographic features also can provide hiding cover.

High Integrity Area. Those areas within the drainage which are functioning the best in terms of providing security, late successional forests, current carnivore sightings, and key habitats. See also Secondary Integrity Area.

High Scenic Integrity Level. A scenic integrity level meaning human activities are not visually evident. In high scenic integrity areas, activities may only repeat attributes of form, line, color, and texture found in the existing landscape character.

Historical Variation. A term used in regard to scenery or visuals, referring to the range of the spatial, structural, compositional, and temporal characteristics of ecosystem elements during a period specified to represent "natural" conditions.

Human Impact or Influence. A term used in regard to scenery or visuals, referring to a disturbance or change in ecosystem composition, structure, or function caused by humans.

I

Immediate Foreground (Visual Distance Zone). That part of the foreground which is extremely critical for visual detail. The IPNF defines immediate foreground as the landscape area located usually within 400 feet

of the observer. The Newport Ranger District defines immediate foreground as the landscape area within the first few hundred feet of the observer, usually within 300 feet of the observer. Distance zones are normally used in project-level planning rather than broad-scale planning.

Improvement Cutting. The removal of less desirable trees of any species in a stand of poles or larger trees, primarily to improve composition and quality.

In-Service. Pertains to activities, actions or personnel within the USDA Forest Service.

Indicator Species. Species of fish, wildlife, or plants adapted to a particular kind of environment, which reflect ecological changes caused by land management activities.

Indirect Effects. Secondary effects which occur in locations other than the initial action or significantly later in time.

Inland Native Fish Strategy (INFS). A decision amending Regional Guides for the Forest Service's Intermountain, Northern, and Pacific Northwest Regions, and Forest Plans for 22 National Forests. The strategy provides interim direction to protect habitat and populations of resident native fish, through riparian management objectives, standards and guidelines, and monitoring requirements.

Intactness. A term used in regard to scenery or visuals, referring to something untouched or unaltered, especially by anything that harms or diminishes its character.

Interdisciplinary Approach. Use of one or more individuals representing areas of knowledge and skills focusing on the same task, problem, or subject. Team member interaction provides needed insight to all stages of the process.

Interdisciplinary Team (IDT). A group of two or more individuals, with different training or skills, assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. The members of the team proceed to solution with frequent interaction, so that each discipline may provide insights to any stage of the problem and disciplines may combine to provide new solutions. This is different form a multidisciplinary team, where each specialist is assigned a portion of the problem and their partial solutions are linked together at the end to provide the final solution. The forming of the team, the data collection and analysis, team discussions, interactive evaluation, and joint resolution of the problem in the Interdisciplinary Process.

Intermittent Stream. A stream which flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow.

Irretrievable. Applies to losses of production, harvest, or a commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports (recreation) site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible. Applies primarily to the use of nonrenewable resources, such as minerals, or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Issue. A point, matter, or question of public discussion or interest, to be addressed or resolved through the planning process.

Issue Indicator. A specific, measurable element which expresses some feature or attribute relative to an issue.

J

Jackpot Burning. A modified method of broadcast burning used primarily to burn concentrations of fuels where the fuelbed is not continuous.

L

Land Allocation. The assignment of a management emphasis to particular land areas with the purpose of achieving goals and objectives. Land allocation decisions are documented in environmental analysis documents, such as the Forest Plan for the Idaho Panhandle National Forests.

Landform. One of the attributes or features that make up the Earth's surface, such as a plain, mountain, or valley.

Landscape. An area composed of interacting ecosystems that are repeated because of geology, land form, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern which is determined by interacting ecosystems.

Landscape Character. Particular attributes, qualities, and traits of a landscape that make it identifiable or unique.

Landscape Character Goal. A management prescription designed to maintain or modify the existing landscape character to a desired future state. (See Desired Landscape Character.)

Landscape Setting. The context and environment in which a landscape is set; a landscape backdrop.

Landscape Visibility. Accessibility of the landscape to viewers, referring to one's ability to see and perceive landscapes.

Landtype. A unit of land with similar designated soil, vegetation, geology, topography, climate and drainage. The basis for mapping units in the land systems inventory.

Lethal fires. Fires that kill 90% or more of the dominant tree canopy. These are often called "stand-replacing" fires. They are commonly crown fires, burning with high severity. In general, lethal fires have long return intervals (140 to 250 years or more apart), but affect large areas when they occur. Local examples of these types of fires would be the Sundance and Trapper Peak Fires of 1967 that burned over 80,000 acres in a relatively short time period during late summer drought conditions. Refer to mixed severity fires and nonlethal fires.

Line. An intersection of two planes; a point that has been extended; a silhouette of form. In terms of landscapes, features such as ridges, skylines, structures, changes in vegetation, or individual trees and branches may be perceived as line.

Line Officer. Management personnel within the Forest Service Organization consisting of: Secretary of Agriculture, Chief of Forest Service, Regional Foresters, Forest Supervisors, and District Rangers. Refers to the line of authority and responsibility.

Log Landing. An area where logs are skidded or yarded prior to loading and transportation to a mill.

Lop and Scatter. Branches are cut from felled trees to a predetermined height then scattered to reduce fuel concentrations. The objective is to re-arrange the fuel so as to eliminate concentrations and break up vertical and horizontal continuity. Generally, this treatment hastens natural decomposition and improves esthetic qualities of the treated area.

Low Scenic Integrity. A scenic integrity level meaning human activities must remain visually subordinate to the attributes of the existing landscape character. Activities may repeat form, line, color, or texture common to these landscape characters, but changes in quality of size, number, intensity, direction, pattern, and so on, must remain visually subordinate to these landscape characters.

M

Maintenance. See Road Maintenance.

Management Area (MA). Geographic areas, not necessarily contiguous, which have common management direction, consistent with the Forest Plan allocations.

Management Direction. A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

Management Prescription. A set of land and resource management policies that, as expressed through Standards and Guidelines, trends toward a Desired Future Condition over time.

Management Activity. An activity humans impose on a landscape for the purpose of managing natural resources.

Mature Timber. Trees or an even-aged stand that is capable of reproduction, has attained most of its potential height growth, or has reached merchantability standards. In the context of wildlife, mature forests are those with the characteristics needed to provide habitat for species such as pine marten and pileated woodpecker (generally when the stand is around age 100).

Metapopulation. Clustered, non-contiguous populations that interact at times through geneflow and dispersal.

Middleground. (Visual Distance Zone). The IPNF defines middleground as that part of a scene or landscape which hits between the foreground and background zones. The Newport Ranger District defines middleground as the zone between the foreground and the background in a landscape, usually located from one-half mile to four miles from the observer.

Mitigate. To offset or lessen real or potential impacts of effects through the application of additional controls or actions. Counter measures are employed to reduce or eliminate undesirable or unwanted results.

Mixed Conifer. See Timber Types.

Mixed severity fires. Fires that kill more than 10% but less than 90% of the dominant tree canopy. These fires are commonly patchy, irregular burns, producing a mosaic of different burn severities. Return intervals on mixed severity fires may be quite variable. Refer to nonlethal and lethal fires.

Monitoring and Evaluation. The evaluation, on a sample basis, of Forest Plan management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

N

National Environmental Policy Act (NEPA) Process. An interdisciplinary process, which concentrates decisionmaking around issues, concerns, alternatives and the effects of alternatives on the environment.

National Forest Management Act (NFMA). Law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring preparation of Regional Guides and Forest Plans, and the preparation of regulations to guide that development.

Natural Disturbance. Periodic impact or natural events such as fire, severe drought, insect or disease attack or wind.

Natural Landscape Character. Landscape character that originated from natural disturbances such as wildfires, glaciation, succession of plants from pioneer to climax species, or indirect activities of humans, such as inadvertent plant succession through fire prevention.

Natural-Appearing Landscape Character. Landscape character that has resulted from human activities, yet appear natural, such as historic conversion of native forests into farmlands, pastures, and hedgerows that have reverted back to forests through reforestation activities or natural regeneration.

Natural Regeneration. Renewal of a tree crop by natural means using natural seed fall.

No-Action Alternative. The No-Action Alternative is required by regulations of the National Environmental Policy Act (NEPA) (40 CFR 1502.14). The No-Action Alternative provides a baseline for estimating the effects of other alternatives. Where a project activity is being evaluated, the No-Action Alternative is defined as one where current management direction would continue unchanged.

Nongame Species. All wild animals not subject to sport-hunting and fishing regulations.

Nonlethal fires. Fires that kill 10% or less of the dominant tree canopy. A much larger percentage of small understory trees, shrubs and forbs may be burned back to the ground line. These are commonly low-severity surface and understory fires, often with short-return intervals (a few decades). Refer to mixed severity and lethal fires.

Nonpoint Source (NPS) Pollution. Diffuse sources of water pollution that originate from many indefinable sources and normally include agricultural and urban runoff, run-off from construction activities, etc. In practical terms, nonpoint sources do not discharge at a specific, single location (such as a single pipe). Nonpoint source pollutants are generally carried over or through the soil and ground cover via stormflow processes. Unlike point sources of pollution (such as industrial and municipal effluent discharge pipes), nonpoint sources are diffuse and can come from any land area. It must be kept in mind that this definition is necessarily general: legal and regulatory decisions have sometimes resulted in certain sources being assigned to either the point or nonpoint source categories because of consideration other than their manner of discharge (for example, irrigation return flows are designated as "nonpoint sources" by law, even though the discharge is through a discrete conveyance).

Normal Operating Season. A portions of a year when normal timber harvesting operations are expected to take place uninterrupted by adverse weather conditions.

Noxious Weeds. Rapidly spreading plants which can cause a variety of major ecological impacts to both agriculture and wild lands.

O

Obliteration. See Road Obliteration.

Observer Position. Specific geographic position in the landscape where the viewer is located. Also known as viewer platform.

Old-growth Forest. Old-growth forests are considered ecosystems that are distinguished by old trees and related structural attributes. They encompass the later stages of stand development that typically differ from

earlier stages in characteristics such as tree age, tree size, number of large trees per acre and basal area. Attributes such as decadence, dead trees, the number of canopy layers and canopy gaps are also important, but are more difficult to describe because of high variability. (See also Recruitment Old Growth.)

Older Capable Habitat. Stands that are nearing the age at which they would provide "suitable" wildlife habitat. Canopy closures in older capable habitat may not currently meet the needs of flammulated owls.

Open Park-Like Stand. A single stratum of large trees is present. Large trees are common. Young trees are absent or few in the understory. Park-like conditions may exist. (Applies to Newport Ranger District Only)

Open Road Density. A measure of the roads accessible to motorized use which affects wildlife, expressed as miles of road per square mile of area.

Outputs. The goods and services produced from and offered on National Forest lands.

Outsloping. Shaping a road to cause drainage to flow toward the outside shoulder (generally the fill slope), as opposed to insloping which encourages drainage to flow to the inside shoulder (generally the cut slope). Emphasis is on avoiding concentrated water flow.

Overstory. The portion of trees in a forest which forms the uppermost layer of foliage.

P

Park-like Structure. Stands with large scattered trees and open growing conditions, usually maintained by ground fires.

Partial Retention. A visual quality objective which, in general, means man's activities may be evident but must remain subordinate to the characteristic landscape.

Pattern. An arrangement of parts, elements, or details that suggests a design or somewhat orderly distribution

Payments to Counties. The portion of receipts derived from Forest Service resource management that is distributed to State and county governments, such as the Forest Service's 25 percent fund payments.

Perennial Streams. Streams that flow continuously throughout the year.

Permittee. Individual or entity that has received a grazing or Special Use Permit from the Forest Service.

Pesticide. A general term applied to a variety of chemical materials including insecticides, herbicides, fungicides and rodenticides.

Pile Burning. Employing top-attached yarding methods, woody debris is removed from a site to a roadside landing or hand-piled on site, where the woody debris can be burned safely and inexpensively. Pile burning is conducted in late fall.

Point Source. Originating from a discrete identifiable source or conveyance.

Population. Spatially-discreet groups of individuals that can freely interbreed.

Preferred Alternative. The alternative recommended for implementation in an EIS (40 CFR 1502.14).

Prescribed Burning. The intentional application of fire to wildland fuels in either their natural or modified state under such conditions as to allow the fire to be confined to a predetermined area and at the same time to

produce the intensity of heat and rate of spread required to further certain planned objectives (i.e., silviculture, wildlife management, reduction of fuel hazard, etc.).

Prescribed Fire. Any fire ignited by management actions to meet specific objectives. Prescribed fire can rejuvenate forage for livestock and wildlife or prepare sites for natural regeneration of trees.

Prescription. Management practices selected and scheduled for application on a designated area to attain specific land and resource management goals and objectives.

Programmatic Document. An environmental document that establishes a broad management direction for an area by establishing a goal, objective, standard, management prescription and monitoring and evaluation requirements for different types of activities which are permitted. It also can establish what activities are not permitted within the specific area(s). This type of document does not mandate or authorize the permitted activities to proceed.

Project Area. The geographic area defining the scope of this document and the alternatives proposed by it.

Purchaser. The entity which is awarded a USDA Forest Service contract after bidding, usually with competition. As used in timber, the entity which has purchased timber as identified in a timber sale contract.

R

Rain-on-Snow Event. A winter storm that is characterized by precipitation falling as rain, rather than snow, and melting of existing snowpack.

Range of Alternatives. An alternative is one way of managing the National Forest, expressed as management emphasis leading to a unique set of goods and services being available to the public. A range of alternatives is several different ways of managing the Forest, offering many different levels of goods and services.

Range of Variability. The spectrum of conditions possible in ecosystem composition, structure, and function considering both temporal and spatial factors.

Reconstruction. See Road Reconstruction.

Recruitment Old Growth. Stands that do not yet have the characteristics of old growth (as defined under "Old Growth Forests," above), but are being managed to develop those characteristics over time.

Reforestation. The natural or artificial restocking of an area with forest trees; includes measures to obtain natural regeneration, as well as tree planting and seeding.

Regeneration. The renewal of a forest, whether by natural or artificial means. This term may also refer to the young trees themselves.

Regeneration Harvest (or Harvesting and Reforesting). <u>For the purposes and intent of this EIS only, the definition of regeneration harvest areas will be as follows:</u> These areas include forest stands in which the Douglas-fir beetle has led to or contributed to high mortality in the stand. In addition to beetles, other disturbance agents which have caused high mortality in the forest stand may include wind, snow, ice, and/or root disease. Generally these are stands of at least five acres in size where greater than 50% of the stand of trees are dead and dying or are expected to die during the beetle outbreak (for the Newport Ranger District, these are stands where less than 40 square feet of live basal area remain). Harvesting involves removing most of the dead trees and some green trees for the purpose of providing growing space for planted seedlings to become established. Both live and dead trees would be retained in an irregular spacing to provide wildlife habitat, maintain visual quality, provide some shelter for seedling establishment, provide a seed source for natural regeneration, and provide woody debris for long-term site productivity. Generally there would be less than 30% of the trees remaining on these areas and the general view would be openings

with scattered leave trees and clumps or patches of leave trees. Most of these retained trees would remain on site for a considerable time after seedlings have established. The size of the open areas created by the beetles and other disturbance agents described above would range from approximately 5 acres to 400 acres, following the pattern of openings created by the beetles. After harvest, logging slash and other debris would be treated, where necessary, to reduce the fire hazard and, on the IPNF, to prepare these sites for reforestation. Prescribed fire or mechanical methods would be used for these treatments. Most of the areas would be planted with western larch, ponderosa pine, and or white pine. The silvicultural prescriptions may include regeneration systems, such as shelterwood with reserves, seed trees with reserves, and group selection.

Residual Stand. Trees remaining standing after some disturbance event, such as fire or logging.

Resilience. The ability of an ecosystem to maintain diversity, integrity, and ecological processes following a disturbance.

Restricted Road. A National Forest road or segment which is restricted from a certain type of use or all uses during certain seasons of the year or yearlong. The use being restricted and the time period must be specified. The closure is legal when the Forest Supervisor has issued and posted an order in accordance with 36 CFR 261.

Revegetation. The replacement of vegetative cover which has been harvested or lost due to natural occurrences. Accomplished either through planting or nursery stock or seeding, or through natural processes.

Riparian Areas/Habitats. Areas of land that are directly affected by water, usually having visible vegetation or physical characteristics reflecting this water influence. Streamsides, lake edges, or marches are typical riparian areas.

Riparian Habitat Conservation Areas (RHCAs). Portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems.

Rip Rapping. The use of a large rock, boulders, concrete chunks or similar non-erosive, heavy objects as an armoring device.

Road Maintenance. The upkeep of the entire Forest Development Transportation Facility including surface and shoulders, parking and side areas, structures, and such traffic-control devices as are necessary for its safe and efficient utilization. Maintenance includes needed brushing, blading, and shaping of the road tread, cleaning ditch lines and culvert inlets, drivable waterbars or rolling dips and revegetation.

Road Maintenance Plan. A document schedule and program for upkeep of roads to provide a level of service for the user and protection of resources. There are five levels of maintenance; Level I being the least intense and Level V being the most intensive.

Road Obliteration. There are varying degrees of road obliteration. **Level 1 Obliteration** includes removal and recontour of all stream crossings and, as needed, recontour of unstable fill slopes, cutslope stabilization, ripping the road tread, installation of no-maintenance cross ditches, and revegetation. Obliteration also includes some kind of road closure method such as with a guard rail barrier, gate, an earthen berm, or a short section of full recontour, called "front end" obliteration. **Front End Obliteration** includes recontouring of the first site distance, or about 250 feet of the road, to stop motorized traffic from entering onto the road. Culverts that pose a high risk of failure because of lack of maintenance would be removed and recontoured concurrently with the closure of the road. **Level 2 Obliteration** includes removal of all stream crossings and full recontour of the entire road prism, introduction of woody debris, and revegetation as needed.

Road Reconstruction. There are varying degrees of road reconstruction. **Light Road Reconstruction** includes, as needed, installation of rolling dips, installation of relief culverts, rolling the road grade for increased drainage, armoring of culvert catch basins and outlets, and adding gravel surfacing. **Heavy Road Reconstruction** includes, as needed, changing the road design, replacing existing stream crossings, cut and fill slope stabilization using gabions or other means, subgrade reinforcements, road prism realignment, and removal of encroaching road fills.

Road Stabilization. Stabilization includes the use of vegetation and geotextiles to control or reduce surface erosion.

Rocking. The application of aggregate to a roadbed to provide strength and a more stable erosion resistant surface.

S

Sale Area Map. A map of suitable scale and detail to be legible which part of a timber sale contract. The map identifies sale area boundaries and contract requirements specific to the sale.

Salvage Harvest. The removal of dead trees or trees damaged or dying because of injurious agents other than competition, for the purpose of recovering economic value that would otherwise be lost.

Sanitation Harvest. Removal of dead, damaged or susceptible trees to prevent the spread of pests or pathogens.

Scale. The degree of resolution at which ecological processes, structures, and changes across space and time are observed and measured.

Scenery. General appearance of a place, general appearance of a landscape, or features of a landscape.

Scenery Management. The art and science of arranging, planning, and designing landscape attributes relative to the appearance of places and expanses in outdoor settings.

Scenic. Of or relating to landscape scenery; pertaining to natural or natural appearing scenery; constituting or affording pleasant views of natural landscape attributes or positive cultural elements.

Scenic Attractiveness. The scenic importance of a landscape based on human perceptions of the intrinsic beauty of land form, rockform, waterform, and vegetation pattern. Reflects varying visual perception attributes of variety, unity, vividness, intactness, coherence, mystery, uniqueness, harmony, balance, and pattern. It is classified as a), distinctive; b) typical or common; or c) undistinguished.

Scenic Class. A system of classification describing the importance or value of a particular landscape or portions of that landscape.

Scenic Integrity. State of naturalness or, conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character in a national forest. "**Very High**" (unaltered) refers to landscapes where the valued landscape character is intact with only minute, if any, deviations. The existing landscape character and sense of place is at the highest possible level. "**High**" (appears unaltered) refers to landscapes where the valued landscape character appears intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident. "**Moderate**" (slightly altered) refers to landscapes where the valued landscape character "appears slightly altered". Noticeable deviations must remain visually subordinate to the landscape character being viewed. "**Low**" (moderately altered) refers to landscapes where the valued landscape character "appears moderately altered". Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles outside the

landscape being viewed. "**Very Low**" (heavily altered) refers to landscapes where the valued landscape character "appears heavily altered". Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or outside the landscape being viewed. "**Unacceptably Low**" (extremely altered) refers to landscapes where the valued landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern or scale from the landscape character.

Scenic Quality. The essential attributes of landscape that when viewed by people, elicit psychological and physiological benefits to individuals and therefore, to society in general.

Scenic Resource. Attributes, characteristics, and features of landscapes that provide varying responses from, and varying degrees of benefits to humans.

Scoping. The procedures by which the Forest Service determines the extent of analysis necessary for a proposed action, i.e., the range of actions, alternatives, and impacts to be addressed, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignments needed.

Secondary Integrity Area. Those areas which contain slightly higher amounts of mature or old forest when compared to other areas in the drainage, yet are highly fragmented and typically have high total road and open road and/or motorized trail densities.

Security. The inherent protection that provides minimal human disturbance and minimal threat of mortality for species that either avoid human disturbance or are directly threatened by trapping, hunting, and/or other forms of mortality.

Sediment. Any material carried in suspension by water, which will ultimately settle to the bottom. Sediment has two main sources: from the channel area itself and from disturbed sites.

Seed Tree Harvest. The cutting of all trees except for a small number of widely-dispersed trees retained for seed production and to produce a new age class in a fully-exposed microenvironment. Some or all of the shelter trees may be retained after regeneration has become established to attain goals other than regeneration.

Seed Trees With Reserves. Harvest where some or all of the shelter trees are retained after regeneration has become established to attain goals other than regeneration.

Seedlings and Saplings. Non-commercial size young trees, generally occurring in plantations.

Seen Area. The total landscape area observed based upon land-form screening. Seen areas may be divided into zones of immediate foreground, foreground, middleground, and background. Some landscapes are seldom seen by the public.

Selective Harvest. <u>For the purposes and intent of this EIS only, the definition of Selective Harvest will be as follows</u>: Most selective harvest would occur in forest stands where less than 50% of the stand is dead or dying or is expected to die from the beetle outbreak and other disturbance agents. Due to special management concerns such as public safety, maintaining visual quality, or to meet specific wildlife habitat requirements, some selective harvest would be done in areas where more than 50% of the stand is dead or dying. For the Newport Ranger District, selective harvest would be used in all stands where greater than 40 square feet of live basal area remain. On most areas, selective harvest would remove only dead trees, but in some areas, where there is the opportunity to maintain or enhance the growth of the desired western larch or ponderosa pine or move the stand towards desired structural stages, green trees would be removed in addition to the dead Douglas-fir. The green trees to be removed would generally be the smaller trees which would be "thinned out." Most stands that are described as selective harvest would not be open enough to allow for successful establishment of desired tree species. The number of trees remaining in these areas

would vary, but stands would generally not look much different than before harvest except for fewer dead trees. Following harvest, fuel hazards may be reduced by use of fire or mechanical methods where these are appropriate. The silvicultural prescriptions may include treatments such as salvage, thinning, and improvement cutting.

Sense of Place. A concept that focuses on the subjective and often shared experience or attachment to the landscape emotionally or symbolically. It refers to the perception people have for a physical area with which they interact, whether for a few minutes or a lifetime, that gives that area special meaning to them, to their community, or to their culture.

Sensitivity Level. Measure of people's concerns for the scenic quality of the National Forest. Sensitivity levels are determined for land areas viewed by people who are: traveling through the forest on developed roads and trails; using areas such as campgrounds and visitor centers; or recreating at lakes, streams and other water bodies. There are three sensitivity levels for identifying the different levels of concern a visitor/user has for the visual scenic quality they experience. They are classified as: Level I - Highest Sensitivity, Level II - Average/Moderate Sensitivity, and Level III - Lowest Sensitivity.

Sensitive Species. Those species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

Seral Stage. A temporal and intermediate stage in the process of succession.

Shade Intolerant. Tree species which grow best in direct sunlight.

Shade Tolerant. Tree species which can tolerate a shaded environment.

Shape. Contour, spatial form, or configuration of a figure. Shape is similar to form, but shape is usually considered to be two-dimensional.

Shelterwood Harvest. The cutting of most trees in an area, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment.

Shelterwood with Reserves. Harvest unit where some or all of the shelter trees in a shelterwood harvest unit are retained after regeneration has become established to attain goals other than regeneration.

Significant Disturbance. Disturbance of surface resources, including soil, water and vegetation, which has the potential to degrade water quality to a level requiring corrective action.

Site Preparation. A general term for a variety of activities that remove or treat competing vegetation, slash, and other debris that may inhibit the establishment of regeneration.

Site Specific. Pertains to a discernible, definable area of point on the ground where a project or activity would (or is proposed) to occur.

Slash. The residue left on the ground after natural or human-caused disturbance.

Snag. A standing dead tree, usually greater than five feet tall and six inches in diameter at breast height. Snags are important as habitat for a variety of wildlife species.

Soil and Water Conservation Practice (SWCP). The set of practices which, when applied during implementation of a project, ensures that soil productivity is maintained, soil loss and water quality impacts are minimized, and water related beneficial uses are protected. These practices can take several forms. Some are defined by state regulation or Memoranda of Understanding between the Forest Service and the States and thus are recognized as Best Management Practices (BMPs). Others are defined by the Forest Service interdisciplinary teams or described in Forest Service Handbooks for application Forest-wide. Both kinds of

SWCP are included in the Forest Plan as Forest-wide standards or are referenced in the plans. A third kind of SWCP is identified by the interdisciplinary team for application to specific management areas; these are included as Management Area Standards in the appropriate management areas in the Forest Plan. A fourth kind, project level SWCPs, are based on site specific evaluations and represent the most effective and practical means of accomplishing the soil and water resource goals of the specific area involved in the project. These project level conservation practices can either supplement or replace the Forest Plan for specific projects. This handbook would aid in the development of the fourth kind of SWCP.

Soil Productivity. The capacity of the soil to produce a specific crop such as fiber and forage, under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.

Space. A limited extension in one, two or three dimensions or a volume. Expanse of a landscape, such as the floor, walls, and ceiling of an "outdoor room."

Special Use Permit. A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest land for some special purpose.

Specified Road. A forest development transportation system road that is identified in and to be constructed or reconstructed under a Forest Service contract.

Stand. A contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality to be a distinguishable unit.

Stand Composition. The proportion of each tree species in a stand expressed as a percentage of either the total number, basal area, or volume of all tree species in the stand.

Stand Conversions. Application of silvicultural practices that change the species composition of trees in a stand, including planting a variety of species, discrimination against undesirable species during thinning, and other practices that naturally discriminate against undesirable species, such as specific site preparation and harvest methods.

Stand Structure. The horizontal and vertical distribution of components of a forest stand, including the height, diameter, crown layers, and stems of trees, shrubs, herbaceous understory, snags, and down woody debris.

Stocking. The degree to which trees occupy the land, measured by basal area and/or number of trees by size and spacing, compared with a stocking standard; that is, the basal area and/or number of trees required to fully utilize the land's growth potential.

Stream Order. It is often convenient to classify streams within a drainage basin by systematically defining the network of branches. Each nonbranching channel segment (smallest size) is designated a first-order stream. A stream which receives only first-order segments is termed a second-order stream, and so on. The order of a particular drainage basin is determined by the order of the principle or largest segment.

Streamside Management Zone (SMZ). A designated zone that consists of the steam and an adjacent area of varying width where management practices that might affect water quality, fish, or other aquatic resources are modified. The SMZ is not a zone of exclusion, but a zone of closely managed activity. It is a zone which acts as an effective filter and absorptive sone for sediment, maintains shade, projects aquatic and terrestrial riparian habitats, protects channel and streambanks, and promotes floodplain stability. The SMZ may be wider than the riparian area.

Structural Stages. The Newport Ranger District defines structural stages as classifications used to characterize the vegetation structure of the stand. The classifications are described by criteria such as number of canopy layers, presence or absence of large trees, relative amounts of different tree sizes, snags and down woody material. There are several structural stages. Stages 1, 2 and 3 are considered "early" stages, and

include stand initiation through stem exclusion. Stages 4 and 5 are considered "middle" and include understory re-initiation and multi-stratum without at least eight "large" trees (at least 21-inches DBH). Stage 6 is multi-stratum with large trees; and Stage 7 is single storied with large trees. Structural Stages 6 and 7 are considered "late and old structure" (LOS) in this analysis.

Structure. How the parts of ecosystems are arranged, both horizontally and vertically. Structure might reveal a pattern, or mosaic, or total randomness of vegetation.

Subordinate. A term used in regard to scenery or visuals, referring to landscape features that are inferior to, or placed below, another in size, importance, brightness and so on. Features that are secondary in visual impact or importance.

Successional Stage. A stage or recognizable condition of a plant community which occurs during its development from bare ground to climax.

Suitable Forest Land. Forest land (as defined in CFR 219.3, 219.14) for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there is reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.4); and for which there is management direction that indicates that timber production is an appropriate use of that area.

Suitable Habitat. Wildlife habitat that currently has both the fixed and variable stand attributes that enable it to produce the habitat requirements for a given species. Fixed attributes of a stand do not change over time, and may include elevation, aspect, landtype, slope, and habitat type. Variable attributes change over time and may include seral stage, cover type, stand density, tree size, stand age, or stand condition. See also Capable Habitat.

Sustainability. The ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time.

Sustainable. The yield of a natural resource that can be produced continually at a given intensity of management is said to be sustainable.

T

Texture. Visual interplay of light and shadow created by variations in the surface of an object. Grain or nap of a landscape or a repetitive pattern of tiny forms. Visual texture can range from smooth to coarse.

Thermal Cover. Vegetation used by animals to modify the adverse effects of weather. A forest stand that is at least 40 feet in height with tree canopy cover of at least 70 percent provides thermal cover. These stand conditions are achieved in closed sapling-pole stands and by all older stands unless the canopy cover is reduced below 70 percent. Deciduous stands may serve as thermal cover in summer, but not in winter.

Thinning. A cultural treatment to reduce the density of trees in a stand, primarily to improve growth and enhance forest health, or to recover potential mortality.

Threatened Species. Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and which has been designated in the Federal Register as such. In addition, some States have also declared certain species as Threatened in their regulations or statutes.

Tiering. Refers to the coverage of general matters in broader Environmental Impact Statements or Environmental Assessments with subsequent other related statements in Environmental Assessments incorporated, by reference, the discussions contained in the previous document, solely on the issues specific to the statement subsequently prepared.

Timber Types. A descriptive classification of forestland based on present occupancy of an area by tree species (i.e., lodgepole, mixed conifer). More appropriately called forest cover types, this category is further defined by the composition of its vegetation and/or environmental factors that influence its locality.

Tractor. Any logging system which uses ground-based machines.

Trampling. Fuel is treated by crushing it. Trampling is utilized in areas where fuels are relatively light and the area is limited by slope (usually areas that are harvested with a machine). The objective is to mix fuel with soil to hasten decomposition and provide for nutrient cycling.

Typical or Common Landscape. A term used in regard to scenery or visuals, referring to prevalent, usual, or widespread landscapes within a landscape province. It also refers to landscapes with ordinary and routine scenic attractiveness.

Travel Corridor. The habitat pathway that allows an animal to move from one place to another.

U

Underburning. A prescribed fire method designed to meet various resource objectives where a tree canopy is present and is to be preserved. The treatment reduces woody debris, provides site-preparation for natural or artificially-planted regeneration and eliminates unwanted vegetation. Underburning can also improve wildlife habitat.

Understory. Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Uneven-age Management. The application of a combination of actions needed to simultaneously maintain continuous high-forest cover. Cutting methods that develop and maintain uneven-aged stands are individual-tree and group selection.

Unique. Unequalled, very rare, or uncommon.

Unplanned Ignition. A fire started at random by either natural or human causes or a deliberate incendiary fire.

Unroaded. Area characterized by its lack of existing roads, but not designated as a Roadless Area or Wilderness.

Unsuitable Forest Land. The IPNF defines unsuitable forest land as lands not selected for timber production in Step II and III of the suitability analysis during the development of the Forest Plan due to: (1) the multiple-use objectives for the alternative precludes *scheduled* timber production; (2) other management objectives for the alternative limit timber production activities to the point where management requirements set forth in 36 CFR 219.27 cannot be met; and (3) the lands are not cost-efficient over the planning horizon in meeting forest objectives that include timber production. Land not appropriate for timber production shall be designated as unsuitable in the Forest Plan.

V

Variety. An intermixture, diversity, or succession of different things, forms, or qualities in the landscape.

Variety Class. A term from the Visual Management System. See "Scenic Attractiveness."

Very High Scenic Integrity Level. A scenic integrity level that generally provides for ecological change only.

Very Low Scenic Integrity Level. A scenic integrity level meaning human activities of vegetative and landform alterations may dominate the original, natural landscape character but should appear as natural occurrences when viewed at background distances.

Viable Population. Populations able to survive fluctuations in demographic, genetic, and environmental conditions and maintain its vigor and potential for evolutionary adaptation over a long period of time (Soule, 1987).

Viewshed. Sub-units of the landscape where the visitor's view is contained by topography similar to a watershed.

Visual. A mental image attained by sight.

Visual Absorption Capability. A classification system used to denote relative ability of a landscape to accept human alterations without loss of character of scenic quality.

Visual Quality Objective (VQO). The IPNF defines Visual Quality Objective as a system of indicating the potential expectations of the visual resource by considering the frequency an area is viewed and the type of landscape. The Newport Ranger District defines Visual Quality Objective as a desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area, referring to the degree of acceptable alterations of the characteristic landscape. Under the Newport definition, all VQO's except "Preservation" imply that there will be management activities: "**Preservation**": In general, human activities are not detectable to the visitor; usually provides for ecological change only. "**Retention:**" Human activities are not evident to the casual Forest visitor. "**Partial Retention**": Human activities may be evident, but must remain subordinate to the characteristic landscape. "**Modification**": Human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground. "**Maximum Modification**": Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background. "**Rehabilitation**": A short-term management alternative used to return existing visual impacts that are undesirable or do not meet adopted VQO's to a desired visual quality. "**Enhancement**": A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists.

Visual Resource. The IPNF defines visual resource as the composite of landforms, water features, vegetative patterns and cultural features which create the visual environment. The Newport Ranger District defines visual resource as the composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

Watershed. Entire area that contributes water to a drainage system or stream.

Wetlands. Those areas that are inundated by surface or groundwater with a frequency sufficient, under normal circumstances, to support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated solid conditions for growth and reproduction. Wetlands included marshes, bogs, sloughs, potholes, wet meadows, river overflows, mud flats, seeps and springs.

Windrowing. To pile slash or debris is a row along the contour of the slope.

Wildland Fire. Any non-structure fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

Wildlife Burning. See Ecosystem/Wildlife Burning.

Wildlife Diversity. The relative degree of abundance of wildlife species, plant species, communities, habitats or habitat features per unit area.

Y

Yarding. A method of bringing logs in to a roadside area or landing, for truck transport. Methods may include forms of skyline cable logging systems, ground-based skidding, balloon, helicopter, etc.

Yield. Measured output; for example, timber yield or water yield.

LIST OF REFERENCES

Introduction

This list of references is organized by discussion area. The "General" section contains those references cited in Chapters I and II, and the introduction of Chapter III. The remainder of the references are organized alphabetically by resource:

- Finances
- Fisheries
- Fuels/Fire and Air Quality
- Heritage Resources
- Noxious Weeds
- Recreation and Scenery
- Soil Productivity
- Threatened, Endangered and Sensitive Plants
- Vegetation
- Watershed
- Wildlife

General

Amman, G.D. and Ryan, K.C. 1991. Insect infestation of fire-injured trees in the Greater Yellowstone Area. Intermountain Research Station. Research Note INT-398.

Atkins, M.D. 1966. Laboratory studies on the behavior of the Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins. Can. Entomol. 98:953-991.

Atkins, M.D. 1975. On factors affecting the size, fat content and behavior of a scolytid. Z. Angew. Entomol. 78:209-218.

Bark Beetle Research at the Pacific Forestry Centre. www.pfc.cfs.nrcan.gc.ca/landscape/beetle/index.html

Byler, J.W and S. Zimmer-Grove. 1990. A forest health perspective on interior Douglas-fir management. *In* Interior Douglas-fir The Species and Its Management Symposium Proceedings. Washington State University. 1991. p. 103-108.

Cornelius, R.O. 1955. How forest pests upset management plans in the Douglas-fir region. J. For. 53:711-713.

Coulson, R.N. and J.A. Witter. 1984. Forest Entomology Ecology and Management. John Wiley & Sons. 669 p. (p. 519).

Evans, D. and Associates, Inc. 1999. Projected deterioration of beetle-killed Douglas-fir on the Idaho Panhandle National Forests. David Evans and Associated, Inc. , 415 118th Avenue Southeast, Bellevue, Washington 98005. 9 p.

Furniss, M.M. 1964. A method to determine progressive mortality during seasonal development of Douglas-fir beetle brood. Journal of Economic Entomology 57:178-180.

Furniss, M.M. 1965. Susceptibility of fire-injured Douglas-fir to bark beetle attack in southern Idaho. J. For. 63:8-11.

Furniss, M.M., M.D. McGregor, M.W. Foiles, and A.D. Partridge. 1979. Chronology and Characteristics of a Douglas-fir beetle outbreak in northern Idaho. USDA For. Serv. Gen. Tech. Rpt. INT-59. 19 p.

Furniss, M.M., R.L. Livingston, and M.D. McGregor. 1981. Development of a stand susceptibility classification for Douglas-fir beetle. In Hazard Rating Systems in Forest Insect Pest Management: Symposium Proceedings. USDA For. Serv. Gen. Tech. Rpt. WO-27. p 115-128.

Furniss, R.L. and V.M. Carolin. 1980. Western Forest Insects. USDA For. Serv. Misc. Publ. No 1339. 654 p. (p.340).

Gast, S.J., M.W. Stock, and M.M. Furniss. 1993. Physiological factors affecting attraction of Ips pini (Coleoptera: Scolytidae) to host odor or natural male pheromone in Idaho. Annals of the Entomol. Soc. Am. 86(4): 417-422.

Gibson, K., E. Lieser, and B. Ping. 1999. Bark beetle outbreaks following the Little Wolf Fire, Tally Lake Ranger District, Flathead National Forest 1994-1998. USDA For. Serv. Northern Region, Forest Health Protection Rpt. 99-7. 15 p.

Goheen, D.J. and E.M. Hansen. 1993. Effects of pathogens and bark beetles on forests. In Schowalter, T.D. and G.M. Filip editors. 1993. Beetle-Pathogen Interactions in Conifer Forests. Academic Press Limited, San Diego, CA 252p. (p.177)

Graham, K., 1959. Release by flight exercises of a chemotrophic response from photopositive domination in Scolytidae. Nature 184: 283-284.

Hagle, S., J. Byler, S. Matthews, R.Barth, J.Stock, B. Hansen, and C.Hubbard. 1994. Root disease in the Coeur d'Alene River Basin: An assessment. In Interior Cedar-Hemlock-White Pine Forests: Ecology and Management. Symposium Proceedings. Washington State University. p. 335-340.

Idaho Department of Lands. 1996. Rules and Regulations: Idaho Forest Practices Act, Title 38, Chapter 13, Idaho Code. Boise, Idaho.

Johnson, N.E., P.W. Orr, and K.H. Wright. 1959. Beetle hazard in windthrown Douglas-fir. Weyerhaeuser Company, Forest Research Note 20, 3p.

Johnson, N.E., K.H. Wright, and P.W. Orr. 1961. Attack and brood survival by the Douglas-fir beetle in four types of windthrown trees in western Washington. Weyerhaeuser Company, Forest Research Note 40, 13p.

Kegley, S. 1998. Using pheromone traps to protect pine stands from pine engraver (Ips pini [Say]) infestation. USDA For. Serv. Northern Region, Forest Health Protection Rpt. 98-3. 3p.

Kegley, S., C. Randall, D. Jewett, and D. Wulff. 1999. Douglas-fir beetle population surveys Idaho Panhandle National Forests, 1998. USDA For. Serv. Northern Region Rpt. No. 99-5. 5 p.

McGregor, M.D., W.E. Bousfield, and D. Almas. 1972. Evaluation of the Douglas-fir beetle infestation in the North Fork Clearwater River drainage, Idaho--1972. USDA For. Serv. Northern Region Rpt. No. I-72-10. 9 p.

McGregor, M.D., M.M. Furniss, W.E. Bousfield, D.P. Almas, P.J. Gravelle, and R.D. Oakes 1975. Evaluation of the Douglas-fir beetle infestation, North Fork Clearwater River drainage, Northern Idaho 1970-73. USDA For. Serv. Northern Region Rpt. No. 74-7. 17 p.

McMullen, L.H. 1956. A note on the mortality of the Douglas-fir beetle in the interior of British Columbia during the winter of 1955-56. Can. Dep. Agric. For. Biol. Div. Sci. Serv. Bimon.Prog. Rep. 12 (6): 3-4.

Quigley, Thomas M. and Sylvia J. Arbelbide. 1997. An assessment of the ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Rasmussen, L.A., Amman, G.D., Vandygriff, J.C., Oakes, R.D., Munson, A.S., and Gibson, K.E. 1996. Bark Beetle and Wood Borer Infestation in the Greater Yellowstone Area Durring Four Postfire Years. Intermountain Research Station. Forest Service General Technical Report INT-RP-487.

Randall, C. and G. Tensmeyer. 1999. Douglas-fir Beetle Hazard Rating System Using the Oracle Database and the Forest Service IBM Platform. USDA For. Serv. Northern Region Rpt. 99-6.

Ross, D.W. and G.E. Daterman, 1994. Reduction of Douglas-fir beetle infestaion in high-risk stands by antiaggregation and aggregation pheromones. Can. J. For. Res. 24: 2184-2190.

Ross, D.W. and G.E. Daterman. 1995. Efficacy of an antiaggregation pheromone for reducing Douglas-fir beetle, Dendroctonus pseudotsugae Hopkins (Coleoptera: Scolytidae), infestation in high risk stands. Can. Entomol. 127:805-811.

Ross, D.W., K.E. Gibson, R.W. Thier, and A.S. Munson. 1996. Optimal dose of an antiaggregation pheromone (3-methylcyclohex-2-en-1-one) for protecting live Douglas-fir from attack by Dendroctonus pseudotsugae (Coleoptera: Scolytidae). J. Econ. Entomol. 89(5):1204-1207.

Schmitz, R.E. and Gibson, K.E. 1996. Douglas-fir beetle. Forest Insect and Disease Leaflet 5. United States Department of Agriculture.

Schowalter, T.D. 1981. Insect herbivore relationship to the state of the host plant: Biotic regulation of nutrient cycling through ecological susccession. Oikos 37: 126-130.

Schwandt, J. 1999. Key points from information sharing regarding the Douglas-fir beetle and management alternatives, Meeting of Specialists, Coeur d'Alene, ID 12/15/98. 6 p.

Shea, P.J. and M. Neustein. 1995. Protection of a rare stand of Torrey Pine from Ips paraconfusus. pp 39-43 in Application of Semiochemicals forManagement of Bark Beetle Infestations--Proceedings of an Informal Conference.
USDA For. Serv. Gen. Tech. Rpt. INT-GTR-318.

Shore, T.L. and L. Safranyik. 1992. Susceptibility and risk rating systems for the mountain pine beetle in lodgepole pine stands. Forestry Canada Pacific and Yukon Region Pacific Forestry Center BC-X-336. 12pp.

Steele, R., R.E. Williams, J.C. Weatherby, E.D. Reinhardt, J.T. Hoffman, R.W. Thier. 1996. Stand Hazard Rating for Central Idaho Forests. General Technical Report INT-GTR-332, 29 pp.

USDA Forest Service Pacific Northwest Region and Washington Dept of Fish and Wildlife. December, 1997. Memorandum of Understanding regarding provisions for implementing hydraulic projects under requirements of the Washington Hydraulic Code Rules (WAC 220-110).

USDA Forest Service. February, 1998. Toward An Ecosystem Approach: An Assessment of the Coeur d'Alene River Basin. USDA Forest Service, Idaho Panhandle National Forests. Ecosystem Paper #4.

USDA Forest Service. March 4, 1998a. Briefing on the February 10, 1998 windstorm that damaged 103,000 acres of National Forests in Deep East Texas.

USDA Forest Service. October, 1998. Northern Region Overview Detailed Report and Summary - October 1998: Northern Region, Missoula, MT.

USDA Forest Service. 1995. Inland Native Fish Strategy Environmental Assessment and Decision Notice. Intermountain, Northern, and Pacific Northwest Regions. USDA Forest Service.

USDA Forest Service. 1988. Colville National Forest Land and Resource Management Plan Final Environmental Impact Statement and Accompanying Record of Decision. Pacific Northwest Region, Portland, OR.

USDA Forest Service. 1987. Idaho Panhandle National Forests Forest Plan. Final Environmental Impact Statement. Idaho Panhandle National Forests Supervisor's Office, Coeur d'Alene, Idaho.

USDA Forest Service. Geographic Assessment of the Pend Oreille River Basin (Draft, in progress). Idaho Panhandle National Forests, Coeur d'Alene, ID.

Weatherby, J.C. and R.W. Their. 1993. A preliminary validation of a Douglas-fir beetle hazard rating system, Mountain Home Ranger District, Boise National Forest, 1992. U.S.D.A. Forest Service Intermountain Region, Boise, ID. Forest Pest Management Report R4-93-05, 7pp.

Wood, S.L. 1982. The bark and ambrosia beetles of North and Central America (Coleoptera: Scolytidae) a taxonomic monograph. Great Basin Naturalist Memoirs No. 6. 1359 p. (p. 3)

Wright, K.H., and P.G. Lauterbach. 1958. A 10-year study of mortality in a Douglas-fir sawtimber stand in Coos and Douglas counties, Oregon. USDA Forest Service Pacific Northwest Forest and Range Experiment Station Research Paper 27, 29p.

Personal Communications and Unpublished Data

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Fisheries

Averett, Robert C. and Craig MacPhee. 1971. Distribution and growth of indigenous fluvial and adfluvial cutthroat trout (Salmo clarki), St. Joe River, Idaho. Northwest Science 45(1):38-47.

Baltz, D. M., B. Vondracek, L.R. Brown, and P.B. Moyle. 1991. Seasonal changes in microhabitat selection by rainbow trout in a small streams. Trans. Amer. Fish. Soc. 120(2):166-176.

Bilby, R.E. and G.E. Likens. 1980. Importance of organic debris dams in the structure and function of stream ecosystems. Ecology 61(5):1107-1113.

Bilby, R.E., and J.W. Ward. 1991. Large woody debris characteristics in streams draining old growth, clearcut, and second-growth forests in southwestern Washington. Canadian Journal of Fisheries and Aquatic Sciences 48:2499-2508.

Bisson, P.A. and J.R. Sedell. 1982. Salmonid populations in streams in clearcut vs. old growth forests of western Washington. In: Meehan, W.R., T.R. Merrall, J.W. Matthews Eds. Fish and Wildlife Relationships in Old-Growth Forests. Proceedings of a Symposium. Amer. Inst. Fish. Res. Bios. pp 121-130.

Bjornn, T.C. 1971. Trout and salmon movements in two Idaho streams as related to temperature, food, streamflow, cover, and population density. Trans. Amer. Fish. Soc. 100(3):423-438.

Bjornn, T.C. 1975. The St. Joe River cutthroat fishery - a case history of angler preference. Presented at the Western Assoc. of State Game Commissioners. pp 1-2.

Bjornn, T.C. and D.W. Reiser. 1996. Habitat Requirements of Salmonoids in Streams. American Fisheries Society Special Publication 19:83-138, 1991.

Bjornn, T.C.; Reiser, D.W. 1991. Habitat requirements of salmonids in streams: Influences of forest and rangeland management on salmonid fishes and their habitats. W.R. Meehan, ed. Bethesda, MD: American Fisheries Society Special Publication 19: 83-138

Bjornn, T.C. 1957. A survey of the fishery resources of Priest and upper Priest Lakes and their tributaries, Idaho. University of Idaho. Masters Thesis.

Campbell, Ronald F. and J. H. Neuner. 1985. Seasonal and diurnal shifts in habitat utilized by resident rainbow trout in western Washington Cascade mountain streams. In: Forest Olson, Robert G. White, and R.H. Hamre Technical Eds. Proceedings of the Symposium on Small Hydropower and Fisheries. pp 39-48.

Chamberlin, T.W., R.D. Harr, and F.H. Everst. 1991. American Fisheries Society Special Publication 19:181-205.

Chapman, D.W. and K.P. McLeod. 1987. Development of criteria for fine sediment in the Northern Rockies ecoregion. EPA 910/9-87-162. 279pp.

Cross, P.D. 1992. Status of bull trout on the Idaho Panhandle National Forests. USDA Forest Service, Coeur d'Alene, Idaho.

Dambacher, J.M. and K.K. Jones. Stream Habitat of Juvenile Bull Trout Pupulations in Oregon and Benchamarks for habitat Quality. Oregon Department of Fish and Wildlife, Research and Development Sections.

J. Davis Idaho Department of Fish and Game, Personnel Communication.

Dolloff, C.A. and G.H. Reeves. 1990. Microhabitat partitioning among stream-dwelling juvenile coho salmon *Oncorhynchus kisutch* and Dolly Varden, *Salvelinus malma*. Can. J. Fish. Aquat. Sci. 47:2297-2306.

Dose, J.J. and B.B. Roper. 1994. Long-term changes in low-flow channel widths within the South Umpqua Watershed, Oregon. Water Resources Bulletin 30:993-1000

Dunnigan, J .L. 1997. The Spatial Distribution of Cutthroat trout in the Coeur d' Alene river system, Idaho. Master's Thesis, University of Idaho. Moscow ID. 65pp.

Ecosystem Analysis at the Watershed Scale. 1995. Federal Guide for Watershed Analysis. Version 2.2 Rvised August 1995. Portland, Oregon.

Everest, F. H. and J. R. Sedell. 1984. Evaluating effectiveness of stream enhancement projects. In: Thomas J. Hassler Ed., Proceedings: Pacific northwest stream habitat management workshop. Humboldt State University. pp 246-256.

FEMAT (Forest Ecosystem Management: an ecological, economic, and social assessment). U.S. Printing Office 1993-793-071.

Fields. 1935. Five year fish and game report. St. Joe National Forest. USDA Forest Service.

Fredericks, J. N. Horner, and E. Crawford. 1999. Population assessment and experimental control of lake trout in Upper Priest Lake, Idaho. Idaho Department of Fish and Game, Coeur d'Alene.

Furniss, M.J., T.D. Roelofs, and S.E. Yee. 1991. Road Construction and Maintenance. American Fisheries Society Special Publication 19:297-324.

Gorman, O. T. and J. R. Karr. 1978. Habitat structure and stream fish communities. Ecology 59(3):507-515.

Grette, G. B. 1985. The role of large organic debris in juvenile salmonid rearing habitat in small streams. Master's Thesis. University of Washington, Seattle.

Henjum, M.G.; Karr, J.R.; Bottom, D.L. [and others]. 1994. In: Karr, J.R.; Chu, E.W., eds. Interim protection for late-successional forests, fisheries, and watersheds. National Forests East of the Cascade Crest, Oregon and Washington, Eastside Forests Scientific Society Panel. Bethesda, MD: The Wildlife Society: 129-168

Hickman, T. and R. F. Raleigh. 1982. Habitat suitability index models: cutthroat trout. FWS/OBS-82/10.5. WELUT, Fort Collins, Co. 38pp.

Hicks, B.J., J.D. Hall, P.A. Bisson, and J.R. Sedell. 1991. Responses of salmonids to habitat changes. American Fisheries Society Special Publication 19:483-518.

Hicks, B. J. 1990. The influence of geology and timber harvest on channel geomorphology and salmonid populations in Oregon coast range streams. Doctoral Dissertation. Oregon State University, Corvallis.

Horton, W.D. 1985. North Idaho Stream Fisheries Research. Rivers and Streams Investigations. Job Performance Report. F-73-R-7. Idaho Department of Fish and Game. 28pp.

INFS (Inland Native Fish Strategy). 1995. Environmental Assessment. Intermountain, Northern, and Pacific Northwest Regions. USDA Forest Service.

Jones, J.A., and G.E. Grant. 1996. Peak Flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. Water Resources Research. Vol. 32 pp 959-974.

Jakober, M.J. 1995. Autum and Winter Movement and Habitat Use of Resident Bull Trout and Westslope Cutthroat Trout in Montana. Master's Thesis. Montana State University, Bozema
Karr, J. R. and D. R. Dudley. 1981. Ecological perspectives on water quality goals. Env. Man. 5:55-68.

Karr, J. R. and K. E. Freemark. 1983. Habitat selection and environmental gradients: dynamics in the "stable" tropics. Ecology 64(6):1481-1494.

Lee, D.C. J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams. 1991. Broadscale Assessment of Aquatic Species and Habitats. An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins. Vol III. Chapter 4.

Lewynsky, V.A. 1986. Evaluation of special angling regulations in the Coeur d'Alene River trout fishery Moscow, ID: University of Idaho. M.S. thesis.

Lider, E. L. and H.B Techau. 1994. Taft Bell Sediment and Fisheries Monitoring Project. USDA Forest Service, Idaho Panhandle National Forests, Coeur d'Alene, ID. 54pp

Lukens, J.,T.C. Bjornn and R. Van Gundy. 1976. Wolf Lodge Creek Cutthroat trout studies. Contribution No. 45. University of Idaho, Moscow, ID. 33pp.

Maclay, David J. 1940. Tentative fish management plan St. Joe National Forest. USDA Forest Service. 25pp.

Maclay, David J. 1940. Tentative fish management plan Coeur d' Alene National Forest. USDA Forest Service, 23pp.

Markle, D.F., D.L. Hll Jr., and C.E. Bond. 1996. Sculpin identification workshop and working guide to freshwater sculpins of Oregon and adjacent areas. Revision 1.1. Department of Fisheries and Wildlife. Oregon State University, Corvallis.

Martin, D. J., E. O. Salo, et al. 1981. The impact of managed streamside timber removal on cutthroat trout and the stream ecosystem. Final Report. Seattle, WA: Univ. of WA, Fisheries Research Institute. 65pp.

Meehan, W.R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 17.

Mesa, Matthew G. 1991. Variation in feeding, aggression, and position choice between hatchery and wild cutthroat trout in an artificial stream. Trans. Amer. Fish. Soc. 120:723-727.

Moore, K. M. S. and S. V. Gregory. 1988. Summer habitat utilization and ecology of cutthroat trout fry in Cascade Mountain streams. Can. J. Fish. Aquatic. Sci. 45:1921-1930.

McFadden, James T. 1969. Dynamics and regulation of salmonid populations in streams. In: T.G. Northcote Ed. Symposium on Salmon and Trout in Streams. Univ. British Columbia. pp. 313-329.

Meisner, J.D. 1990. Effect of climatic warming on the southern margins of the native range of brook trout, *Salvelinus fontinalis*. Canadian Journal of Fisheries and Aquatic Sciences. 47: 1065-1070.

Orth, Donald J. 1987. Ecological considerations in the development and application of instream flow habitat models. Regulated Rivers: Research and Management 1:171-181.

Reel, S. et al. 1989. Caring for our natural community. USDA Forest Service. Northern Region Wildlife and Fisheries publication.

Reeves, G. H., L. E. Benda, K. M. Burnett, P. A. Bisson, and J. R. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonids in the Pacific northwest. American Fisheries Society Symposium 17:334-349.

Reeves, G. H., F. H. Everest, and J. R. Sedell. 1993. Diversity of juvenile anadromous salmonid assemblages in coastal Oregon basins with different levels of timber harvest. Transactions of the American Fisheries Society 122:309-317.

Rieman, B. and K. Apperson. 1989. Status and analysis of salmonid fisheries: Westslope cutthroat trout synopsis and analysis of fishery information. Idaho Department of Fish and Game. Project F-73-R-11, Subproject No. 11, Job No. 1. 112 pp.

Rieman, B.E.; McIntyre, J.D. 1993. Demographic and habitat requirements of bull trout Salvelinus confluentus. General Technical Report INT-GTR-302. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.

Rieman, B., Rocky Mountain Research Station, personal communication.

Rosgen, David L. 1994. A classification of natural rivers. Catena 22:169-199.

Schlosser, I.J. 1982. Trophic structure, reproductive success, and growth rate of fishes in a natural and modified headwater stream. Can. J. Fish. Aquat. Sci. 39:968-978.

Sedell, James R., P. A. Bisson, F. J. Swanson, and S. V. Gregory. 1988. What we know about large trees that fall into streams and rivers. In: Chris Maser, Robert F. Tarrant, James M. Trappe, and Jerry F. Franklin, Technical Ed., From the Forest to the Sea: a Story of Fallen Trees. Gen. Tech. Rep. PNW-GTR-229. USDA Forest Service Pacific Northwest Forest and Range Experiment Station, Portland, OR. 153pp.

Simpson, J.C and Wallace R.L., 1978. 1982. Fishes of Idaho . University Press of Idaho, Idaho Research Foundation, Inc. Moscow 237pgs.

State of Idaho Department of Health and Welfare. 1993. Idaho Department of Health and Welfare Rules, IDAPA 16, Title 1, Chapter 2, "Water quality standards and wastewater treatment requirements." Division of Environmental Quality, Administrative Procedures Section. Boise, Idaho. p. 20 of 86.

US Fish and Wildlife Service. 90-Day confirmation of forest wide species list. Letter. 3 pp.

USDA Forest Service. 1995. Inland Native Fish Strategy Environmental Assessment, Decision Notice and Finding of No Significant Impact. Intermountain, Northern, and Pacific Northwest Regions.

USDA Forest Service. 1994. Aquatic Ecosystem Strategy. Idaho Panhandle National Forests, Coeur d'Alene, ID. 22 pp.

Williams, Richard N. 1994. Unpublished report on mitochondrial DNA variation among bull trout populations in the Columbia and Klamath Rivers. Clear Creek Genetics. Meridian, ID. 2 pp.

Wydoski, R.S. and R.R. Whitney. Inland Fishes of Washington. University of Washington Press, Seattle.

Fuels/Fire and Air Quality

Agee, James K. 1996. Influence of Forest Structure on Fire Behavior. In: Proceedings of the 17th Forest Vegetation Management Conference. January 6-18, 1996. Redding, Ca.

Agee, James K. 1997 The Severe Weather Wildfire: Too Hot to Handle?, In: Northwest Science; Vol 71 No. 1:153-156

Anderson, Hal E. 1982. Aids to determining fuel models for estimating fire behavior. USDA Forest Service Gen. Tech. Rep INT-122, 22pp. Intermountain Forest and Range Experimental Station, Ogden, Utah

Arno, Stephen F. and Davis, Dan H. 1980. Fire History of Western Red Cedar/Hemlock forests in North Idaho.

Barrett, Stephen W. 1994. It's Too Lake for Fire Alone to Work. In Wildfire, March 1995, reprinted from the Missoulian, August 21, 1994.

Brown, James K. 1974. Handbook for Inventorying Downed Woody Material, USDA Forest Service Gen. Tech. Rep. INT-16. USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT.

Brown, James K. and J.A. Snell. 1980. Handbook for Predicting Residue Weights of Pacific Northwest Conifers, USDA Forest Service Pacific Northwest Forest and Range Experiment Station, Portland, OR. Gen. Tech. Rep. PNW-103.

Everett, R. L., Camp, A. E., and Schellhaas R, 1995, Building a New Forest With Fire Protection in Mind. A paper presented at the Fire Protection Working Group Technical Session at the SAF National convention held at Portland, Maine, October 28 - November 1, 1995.

Graham, Russell T., Alan E. Harvey, et al. 1994. Managing Coarse Woody Debris in Forests of the Rocky Mountains. Research Paper INT-RP-477. USDA Forest Service Intermountain Research Station, Ogden, UT.

Hartman, David A., William A. Atkinson, Ben S. Bryant, and Richard O. Woodfin. Date unknown. Conversion factors for the Pacific Northwest forest industry. Institute of Forest Products, University of Washington.

Harvey, Alan E. Interactions Between Forest Health and the Carbon Cycle: Inland Northwest American and Global Issues, A paper presented at the Forest Health Wroking Goup session at the SAF National Convention held at Anchorage, Alacka, on September 18-22, 1984.

Harvey, Alan E., Hessburg, Paul F., Byler, James W., McDonald, Geral I., Weatherby, Julie C., and Wickman, Boyd E., 1995 Health Declines in Western Interior Forests: Symptoms and Solutions. From 1995 Symposium Proceedings of Ecosystem Management in Western Interior Forests, held May 3-5, 1994 in Spokane, Washington.

Harvey , George M. and Kenneth H. Wright. 1967. Guidelines for salvaging beetle-killed Douglas-fir. Gen. Tech. Rep. PNW-50. USDA Forest Service Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Idaho Associated Logging Contractors, Idaho Department of Lands, Intermountain Forest Industry Association, USDA Forest Service, Montana Department of Lands, Montana Logging Association, 1995. Assessing Reserve Trees.

Jain, Terri. 1998. Memo describing method for estimating course woody debris amounts.

Keane, Robert; Garner, Janice; Schmidt, Kirsten; Long, Donald; Menakis, James and Finney, Mark USDA, March 1998 RMRS-GTR-3. Development of Input Spatial Data Layers for the FARSITE Fire Growth Model for the Selway-Bitterroot Wilderness Complex, USA.

Keane, Robert 1999, Personnal communication concerning foliar fuel moisture in green vs. dead trees and effect on crown fire risk.

Leiberg, John B 1897. General Report on a Botanical Survey of the Coeur d'Alene Mountains in Idaho During the Summer of 1895. From U.S. National Herbarium.

NWCG. 1992. Fire Behavior Field Reference Guide, A Publication of the National Wildfire Coordination Group.

Pollet, Jolie and Ome, Philip, 1999. Effect of Thinning and Prescribed Burning on Wildfire Severity in Ponderosa Pine Forests, INT-95075-RJVA

Reinhardt, Elizabeth; James Brown, William Fischer, and Russell Graham. 1991. Woody fuel and duff consumption by prescribed fire in northern Idaho mixed conifer logging slash. Intermountain Research Paper, INT-443. USDA Forest Service Intermountain Research Station, Ogden, UT.

Reinhardt, Elizabeth, 1999. Personnal Communication concerning use, interpretation and display of output data, FFE-FVS model.

Scott, J. H. 1998, Sensitivity Analysis of a Method for Assessing Crown Fire Hazard in the Northern Rocky Mountains, USA . In: III International confer. on Forest Fire Research, 14th Conference on Fire and Forest Meteorology Vol II, pp 2517-2532, Luso, 16/20 November 1998.

Scott, J. H. 1999, Pers. Communication Concerning: Sensitivity Analysis of a Method for Assessing Crown Fire Hazard in the Northern Rocky Mountains, USA .

Spurr, S.H., and B.V. Barnes, 1980. Forest Ecology. John Wiley & Sons, New York, Chapter 16, pages 421-428 and 437-439.

State of Montana. 1988. Smoke Management Memorandum of Agreement. In: Fuel Management Planning and Treatment Guide, Appendix D. USDA Forest Service Northern Region Aviation and Fire Management.

USDA 1999a, PNW-GTR-number pending, The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests. Graham, Russell T.; Harvey, Alan E.; Jain, Theresa B.; Tonn, Jonalea R.

USDA, 1999b 995-2808-MTDC Wildland Fire Fatalities in the United States: 1990-1998.

USDA, 1999c Reducing the Wildland Fire Threat to Homes: where and how much? Jack D. Cohan, RMRS. Paper presented at the Fire Economics Symposium, San Diego, CA April 12, 1999.

Wildland Fire Fatalities in the United States: 1990-1998.

USDA, 1998a. Fuels Management - 1987/88 Douglas-fir Bark Beetle kill sites, fuel accumulation survey and risk implications. Idaho Panhandle National Forests, Coeur d'Alene, ID. Grant, Mark A.

USDA, 1998b Fuels and Fire Effects Model: Model Description, Beakema, Sarah; Greenough, Julee; and Robinson, Don. 7/28/98, revised 2/16/1999 as a working draft.

USDA 1998c R6-NR-ECOL-TP-06-98. Vegetation Response after Wildfires in National Forests Of Northeastern Oregon.

USDA Forest Service. 1998c. Outbreak Incident: Responding to the Douglas-fir Beetle Infestation, Idaho Panhandle National Forests, Coeur d'Alene, ID and Colville National Forest, Colville, WA.

USDA, 1997a, INT-GTR-363, Fire Ecology of the Forest Habitat Types of Northern Idaho.

USDA, 1997b, Integration of Wildland Fire Management Into Land Management Planning, A Desk Guide.

USDA, 1997c Reference Guide for Fire Model Keywords, Beakema, Sarah; Greenough, Julee; and Robinson, Don. 8/27/97.

USDA, 1997d INT-GTR 344 First Order Fire Effects Model (FOFEM).

USDA, 1996, INT-GTR-341, The Use of Fire in Forest Restoration.

USDA 1995 Reserve Tree Guide,

USDA 1994, PNW-GTR-320, Fire and Weather Distrubances in Terrestrial Ecosystems of the Eastern Cascades, James K. Agee

USDA, 1985, Snag and Woody Debris Management Guidelines, US Forest Service, Idaho Panhandle National Forests

USDA, 1978, When the Mountains Roared, Stories of the 1910 Fire.

USDA, 1976, GTR INT-30 Estimating Wildfire Behavior and Effects.

USDA, 1968 INT-56, Sundance Fire: An Analysis of Fire Phenomena.

USDA Forest Service. Forest Service Manual, Title 5100 Fire Management USDA Forest Service. Washington D.C.

USDA, USDI 1996, PNW-GTR-382, Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins.

USDI, USDA, 1996 Federal Wildland Fire Management, Policy and Program Review, Implementation Action Plan Report, May 23, 1996.

USDI, USDA, 1995. Federal Wildland Fire Management Policy and Program Review, Draft Report, June 9, 1995

USDA Forest Service Region One Video: Douglas Hill Incident, Putting Fire Back into the Ecosystem. For a copy Contact Gene Colling, USDA Forest Service, Northern Region, P.O. Box 7669, Missoula MT 59807 or call (406) 329-3090.

US GAO, 1999a, Western National Forests, A Cohesive Strategy is Needed to Address Catastrophis Wildfire Threats, United States General Accounting Office, Report to the Subcommittee on Forests and Forest Health, Committee on Resources, House of Representatives.

US GAO, 1999b, Western National Forests, Nearby Communities Are Increasingly Threatened by catastrophis Wildfires, United States General Accounting Office, Testimony before the Subcommittee on Forests and Forest Health, Committee on Resources, House of Representatives, Statement of Barry T. Hill .

Valdez, M. and Style J.R. 1996, Shout, "Watch Out-Snag!) In; Fire Management Notes, Volume 56, No 3.

Ward, Darold E. 1992. Biomass Consumption and Emissions Production. Smoke Management Training, Presented at Northern Training Center, Missoula, Montana.

Zack, Arthur. 1995 Northern Idaho Forest Ecosystems: Historic Conditions and Current Trends in Forest Succession, Fire, Timber Harvest, and Landscape Pattern, in Dynamics of Northern Idaho Forests, A symposium on Plants, Animals, and People

Zack, A and Morgan, P , 1994; Fire History on the Idaho Panhandle National Forest, Draft

Heritage Resources

Quigley, Thomas M. and Sylvia J. Arbelbide. 1997. An assessment of the ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins, Appendix C. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Noxious Weeds

Callihan, Robert H. and Timothy W. Miller. 1997. Idaho's noxious weeds. Noxious Weed Advisory Council, Idaho Department of Agriculture. Boise, ID. 74 pp.

Callihan, R.H., J.P. McCaffrey, and V.J. Parker-Clark. 1991. Leafy spurge biology and management. Current Information Series No. 877. University of Idaho College of Agriculture Cooperative Extension System. Moscow, Idaho.

Lacey, J.R., C.B. Marlow, and J.R. Lane. 1989. Influence of spotted knapweed (*Centaurea maculosa*) on surface runoff and sediment yield. Weed Technology 3:627-631.

Northwest Coalition for Alternatives to Pesticides (NWCAP), et al. v. Clayton Yeautter. 1989. In: USDA Forest Service, 1988. Region 6 FEIS for Managing Competing and Unwanted Vegetation.

Planty-Tabacchi, Anne Marie. 1996. Invasibility of species rich communities in riparian zones. Conservation Biology 10:2:598-607.

Quigley, Thomas M., Richard W. Haynes and Russell T. Graham, tech. eds. 1996. Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins. Gen. Tech. Report PNW-GTR-382. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. pp. 111-120.

Rice, Peter and Chris Toney 1997. Susceptibility of Northern Region Habitat Types to Invasion by Five Noxious Weed Species - First Approximations. U.S. Forest Service Northern Region. Missoula, Montana. Unpublished.

Roche, C.T., and B.F. Roche, 1991. Meadow Knapweed invasion in the pacific Northwest, USA., and British Columbia, Canada. Northwest Science 65:53-61.

USDA Forest Service. 1998f. Environmental Assessment for Integrated Noxious Weed Treatment, Colville National Forest, Colville, WA.

USDA Forest Service. 1998g. Coeur d'Alene River Ranger District Noxious Weed Draft Environmental Impact Statement. Idaho Panhandle National Forests, Coeur d'Alene, ID.

USDA Forest Service. 1997. Final Environmental Impact Statement: Priest Lake Noxious Weed Control Project. Priest Lake Ranger District, Idaho Panhandle National Forests. Priest Lake, Idaho. Available at Sandpoint Ranger District office.

USDA Forest Service. 1989. Idaho Panhandle National Forest Weed Pest Management Final Environmental Impact Statement. Idaho Panhandle National Forests, Coeur d'Alene, ID.

USDA Forest Service. 1988. Colville National Forest Land and Resource Management Plan Final Environmental Impact Statement and Accompanying Record of Decision. Pacific Northwest Region, Portland, OR.

USDA Forest Service. 1988. Region 6 FEIS for Managing Competing and Unwanted Vegetation as amended by the Mediated Agreement (Northwest Coalition for Alternatives to Pesticides, et al. v. Clayton Yeautter 1989)

Whitson, T.D. et al. 1992. Weeds of the West. The Western Society of Weed Science. Newark, California. 630 pages.

Vallentine, J.F. 1989. Range development and improvements. Academic Press Inc., San Diego, CA. 524 pp.

Zack, Art. 1999. Personal communication with IPNF Ecologist concerning the role of noxious weeds as seral understory components in forested habitats.

Recreation and Scenery

Shultz, Edward L. 1992. Colville National Forest Visual Quality Objective Mapping, Interoffice memo dated September 11, 1992. File reference 2380 and 1920. (This memo identifies the Sensitivity Level I and Level II Travel Routes and Use Areas for each district on the Colville National Forest.)

USDA Forest Service. 1998d. North Zone Geographic Assessment Sense of Place map. Idaho Panhandle National Forests, Coeur d'Alene, ID

USDA Forest Service. 1996. New Moon Watershed Analysis Report and Appendices. Colville National Forest, Colville, WA.

USDA Forest Service. 1995b. Place assessment: How people define ecosystems. A Background Report of the Scientific Assessment for the Interior Columbia Basin Ecosystem Management Project. Walla Walla, WA.

USDA Forest Service. 1995c. Landscape aesthetics: A handbook for scenery management. USDA Forest Service, Publication 701.

USDA Forest Service. 1991. Horizon Final Environmental Impact Statement and Record of Decision. USDA Forest Service, Northern Region, Idaho Panhandle National Forests, Fernan Ranger District. Coeur d'Alene, ID.

USDA Forest Service. 1990. Recreation Opportunity Spectrum Field Guide. U.S. Government Printing Office.

USDA Forest Service. 1989. Searching for the Value of a View.

USDA, Forest Service. 1987. Forest Plan - Idaho Panhandle National Forests, USDA Forest Service, Northern Region. Missoula, MT.

USDA Forest Service. 1986. ROS (Recreation Opportunity Spectrum) Book

USDA Forest Service. 1985. National Forest Landscape Management Volume 2; Chapter 6, Fire. Agriculture Handbook Number 608.

USDA Forest Service. 1985. Attaining Visual Quality Objectives in Timber Harvest Areas.

USDA Forest Service. 1980. Visual Character Types and Variety Class Description

USDA Forest Service. 1979. Idaho Panhandle National Forests Management Plan Map, Visual Quality Objectives. Forest Supervisor's Office, Coeur d'Alene, ID

USDA Forest Service. 1977. National Forest Landscape Management Volume 2; Chapter 4, Roads. Agriculture Handbook Number 483.

USDA Forest Service. 1974. National Forest Landscape Management Volume 2; Chapter 1, The Visual Management System. Agriculture Handbook Number 462.

USDA Forest Service. 1974. National Forest Landscape Management Volume 2; Chapter 5, Timber. Agriculture Handbook Number 559.

USDA Forest Service. Research Paper 193. Pacific Southwest Region.

USDA Forest Service, Research Paper INT-348. Intermountain Research Station.

Soil Productivity

Garrison, M.T., and J.A. Moore. 1998. Nutrient Management: A Summary and Review. Intermountain Forest Tree Nutrition Cooperative Supplemental Report. 98-5.

Graham, R.T., A.E. Harvey, M.F. Jurgensen, T.B. Jain, J.R. Tonn and D.S. Page-Dumroese. 1994. Managing Coarse Woody Debris in Forests of the Rocky Mountains. U.S. Dept. Agric. For. Serv. Intermountain Research Station. Research paper INT-RP-477.

Harrison, J.E., and A.B. Campbell. 1963. Correlations and Problems in Belt Series Strategraphy, Northern Idaho and Western Montana. Geological Society of America Bulletin, V.74, P. 1413-1428.

Morris, L.A. and R.E. Miller. 1994. Evidence for Long-term Productivity Change as Provided by Field Trials. In: Dzck, W.J.; Cole, D.W.; Comerford, N.B., comps., eds. Impacts of Forest Harvesting on Long-term Site Productivity. London; Chapman and Hall: 41-80.

Powers, R.F., D.H. Alban, R.E. Miller, A.E. Tiarks, C.G. Wells, P.E. Avers, R.G. Cline, R.O. Fitzgerald and N.S. Loftus, Jr. 1990. Sustaining Site Productivity in North American Forests: Problems and Prospects. p. 49-79. In: S.P. Gesssel, D.S. Lacate, G.F. Weetman and R.F. Powers (Eds) Proc., of the 7th North American Forest Soils Conference, University of British Columbia, Faculty of Forestry Publication, Vancouver, B.C.

Threatened, Endangered and Sensitive Plants

Allen, Michael F. 1996. The Ecology of Mycorrhizae, Cambridge University Press. Cambridge, Great Britain. 184 pp.

Barbour, Michael G. and William Dwight Billings, eds. 1988. *Blechnum spicant*. In: Fisher, William C., compiler. The fire effects information system database. USDA Forest Service, Intermountain Research Station. Missoula, Montana.

Blake, Jill and C. Ebrahimi. 1992. Species conservation strategy and monitor plan for *Blechnum spicant* (deerfern) for northern Idaho, Idaho Panhandle National Forests, and Clearwater National Forest. USDA Forest Service, Northern Region.

Bursick, Robert J. and Robert K. Moseley, 1995. Ecosystem Conservation Strategy for Idaho Panhandle Peatlands. Cooperative project with Idaho Panhandle National Forests, Coeur d'Alene, Idaho and Conservation Data Center, Idaho Department of Fish and Game, Boise, Idaho.

Bursik, Robert J. and Robert K. Moseley, 1992. Forty year changes in Hager Lake fen, Bonner County, Idaho. Conservation Data Center, Idaho Department of Fish and Game. Boise, Idaho.

Cousens, Michael L. 1981. *Blechnum spicant*: Habitat and vigor of optimal, marginal, and disjunct populations, and field observations of gametophytes. Botanical Gazette. 142(2):251-258.

Crane, M.F. and William C. Fisher. *Holodiscus discolor*. In: Fisher, William C., compiler. The fire effects information system database. USDA. Forest Service, Intermountain Research Station. Missoula, Montana.

Crawford, Rex C. 1980. Ecological investigations and management implications of six northern Idaho endemic plants on the proposed endangered and threatened lists. Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, ID.

Crum, Howard. 1992. A focus on Peatlands and Peat Mosses. University of Michigan Press. Ann Arbor, Michigan.

England, Bonnie J. 1998. Sensitive pland field survey of the Searchlight-Marie-Alder grazing allotment. Unplublished technical report. Coeur d'Alene River Ranger District.

Goodnow, Valerie A. 1998. Sensitive plant field survey of Hayden grazing allotment. Unpublished technical report. Coeur d'Alene River Ranger District.

Greenlee, Jack. 1997. *Cypripedium fasciculatum* Conservation Assessment. USDA Forest Service, Region 1. Lolo National Forest. Missoula, Montana.

Hammet. 1997. Observations while sampling deerfern monitoring plots in Distillery Bay on the Priest Lake Ranger District. September 1997.

Idaho Conservation Data Center. 1998. Rare plant occurrence records, Idaho Conservation Data Center, Idaho Fish and Game. Boise, Idaho.

IPNF. 1998. Idaho Panhandle National Forests Geographic Assessment - Coeur d'Alene subbasin. Coeur d'Alene, Idaho.

Johnson, Fred D. 1983. Glossary of Ecological Terms. College of Forestry, Wildlife, Range Sciences, Experiment Station. University of Idaho. Moscow, ID. 14 pp.

Johnson, Fred D. 1995. Wild Trees of Idaho. University of Idaho Press. Moscow, Idaho.

Kagan, Jimmy. 1990. Draft species management guide for *Cypripedium fasciculatum* for southwestern Oregon. Oregon Natural Heritage Program, Portland, OR. 19 pp.

Leonard, George M. 1992. Memo to Regional Foresters from the Washington Office regarding forest health and biological evaluations. Washington, DC.

Lichthardt, J. and R. K. Moseley. 1994. Ecosystem analysis and conservation planning for the Clearwater refugium, Clearwater and Nez Perce National Forests. Idaho Department of Fish and Game, Natural Resource Policy Bureau, Boise, ID.

Lichthardt, Juanita. 1998. Monitoring of rare plant populations on the Clearwater National Forest: Third annual summary report. Idaho Dept. of Fish and Game, Boise, ID. October 1998.

Lorain, Christine C. 1988. Floristic history and distribution of coastal disjunct plants of the northern Rocky Mountains. Master of Science Thesis. College of Forestry, Wildlife, and Range Sciences, Univ. of Idaho. Moscow, Idaho. April, 198.

Lorain, Christine C. 1989. Field investigation of three Region 1 sensitive species on the Clearwater National Forest, Idaho Dept. of Fish and Game, Boise, Idaho. November 1989.

Lorain, Christine C. 1990. Field investigations of *Botrychium* (moonworts), on the Idaho Panhandle National Forests, Idaho Dept. of Fish & Game, Boise, Idaho. December 1990.

Lorain, Christine C. 1993. Conservation assessment of *Mimulus clivicola* (bank monkeyflower). USDA Forest Service, Pacific Northwest, Intermountain and Northern Regions.

Morse, Larry E. 1996. In Restoring Diversity - Strategies for Reintroducing of Endangered Plant, Donald A. Falk, Constance I. Millar *et al.* Island Press. Washington D.C. pp. 7-22.

Moseley, Robert K. 1998. Personal Communication with Mark Mousseaux, IPNF Botanist. February, 1998.

Moseley, Robert K and Andrew Pitner. 1996. Rare bryophytes and lichens in Idaho: status of our knowledge. Idaho Department of Fish and Game Conservation Data Center. Boise, Idaho.

Mousseaux, Mark R. 1999. Idaho Panhandle National Forests Botanist, information compiled for IPNF North Zone Draft Geographic Assessment.

Mousseaux, Mark R. 1998. Idaho Panhandle Forest Botanist, personal communication.

Mousseaux, Mark. 1998. Idaho Panhandle National Forests Rare Plant Guild Descriptions. IPNF Botanist, Coeur d'Alene, Idaho.

Mousseaux, Mark R. 1997. Idaho Panhandle National Forests Botanist, personal communication regarding Constance's bittercree (*Cardamine constancei*).

Neihoff, Jerry 1998. Soil Scientist, Idaho Panhandle National Forest. Personal Communication on peatland coring in North Idaho Peatlands.

Penny, Diane. 1996. Monitoring effects of thinning and slash handpiling on *Lycopodium dendroideum*. Unpublished technical report. Priest Lake Ranger District.

Penny, Diane. 1995. Monitoring *Botrychium lanceolatum* subsp. *lanceolatum* in Hanna Flats cedar grove. Unpublished technical report. Priest Lake Ranger District.

Rumely, J.H. 1956. Plant ecology of a bog in north Idaho. Ph.D. Dissertation. Washington State University. Pullman, Washington.

Shelly, J.S. 1994. Conservation Strategy for *Howellia aquatilis*, USDA Forest Service, Northern Region. Missoula, Montana.

Shelly, J. S. and Robert K. Moseley. 1988. Report on the conservation status of *Howellia aquatilis*, a candidate threatened species. Unpublished report to the US Fish and Wildlife Service, Denver, Colorafdo. Montana Natural Heritage Program. Helena, Montana. 120 pp.

Soule. 1987. In: Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin, September 1996, PNW-GTR-382.

USDA Forest Service. Forest Service Manual: Wildlife, Fish, and Sensitive Plant Habitat Management with Amendments and Supplements. FSM 2673.43

USDA Forest Service. 1998e. Regional Forester's proposed Sensitive Species List, September, 1998. Missoula Montana.

USDA Forest Service. 1994b. Northern Region Regional Forester's Sensitive Species List, June, 1994. Missoula Montana.

USDA. 1997. March 1997. Terrestrial protocals: Species at Risk. Northern Region. Missoula, MT.

USDI Fish and Wildlife Service. 1998. Biannual forest wide species list. Reference number #FWS 1-9-98-SP-214. Upper Columbia Basin Field Office, Spokane, WA.

USDI Fish and Wildlife Service. 1998a. Section 7 Guidelines, *Spiranthes diluvialis*, dated June 17, 1998. Upper Columbia Basin Field Office, Spokane, WA.

Washington Natural Heritage Program (WHP). 1998. Rare plant occurrence records, electronic database. Washington Natural Heritage Program. Olympia, Washington.

Williams, T.Y. 1990. *Lycopodium obscurum*, In: Fisher, William C., compiler. The fire effects information system database. U.S.D.A. Forest Service, Intermountain Research Station. Missoula, Montana.

Williams, Robert W. 1999. Lettter from Pacific Northwest Regional Forester providing direction for addressing sensitive species. May 13, 1999. Portland, Oregon.

Zika, Peter. 1992. Draft management guide for rare Botrychium species (moonworts and grape-ferns) for the Mount Hood National Forest. Unpublished report on file at the Oregon Natural Heritage Program, Portland, OR.

Vegetation

Agee, James K. 1993. Fire ecology of pacific northwest forests. Island Press, Washington, DC. 493 pp.

Agee, James K. 1996. The influence of forest structure on fire behavior. Annual Forest Vegetation Management Conference. Redding, CA. January 16-18, 1996

Amman, G.D., M.D. McGregor, and R.E. Dolph, Jr. 1989. Mountain Pine Beetle. USDA Forest Service Forest Insect and Disease Leaflet 2. 11 pp.

Arno, Stephen F. and Dan H. Davis. 1980. Fire History of Western Red Cedar/Hemlock Forest in Northern Idaho. pp 21-28.

Atkins, David et al. 1999. Health of Idaho's Forests. USDA Forest Service, Northern Region, Forest Health Protection. Report No. 99-4. 39 pp.

Byler, James W., and Sara Zimmer-Grove. A Forest Health Perspective on Interior Douglas-fir Management. In Interior Douglas-fir; The Species and its Management. Washington State University, Dept. of Natural Resource Science, Cooperative Extension.

Coeur d'Alene River Ranger District, USDA Forest Service, 1998. Douglas-fir Beetle field reconnaissance notes, Coeur d'Alene River Ranger District, Coeur d'Alene, Idaho.

Cooper, Stephen V., Neiman, Kenneth E., Roberts, David W., 1991. Forest Habitat Types of Northern Idaho: A Second Approximation. USDA Forest Service, Intermountain Research Station, General Technical Report INT-236.

Cooper, Stephen et al. 1987. Forest habitat types of northern Idaho: a second approximation. Gen. Tech. Report INT-236. Ogden, Utah. USDA Forest Service, Intermountain Research Station. 135 pp.

Fischer, William C. et al. 1987. Fire ecology of western Montana forest habitat types. Gen. Tech. Report INT-223. Ogden, Utah. USDA Forest Service, Intermountain Research Station. 95 pp. (pg. 32).

Flanagan, P. 1998. Douglas-fir beetles on the Newport Ranger District, Colville National Forest: Hazard rating and outbreak characteristics. Briefing paper, USDA Forest Service, Wenatchee Field Office.

Furniss, M.M. et al. 1979. Chronology and characteristics of a Douglas-fir beetle outbreak in northern Idaho. Gen. Tech. Report INT-59. USDA Forest Service Intermountain Forest and Range Experiment Station, Ogden, Utah. 19 pp.

Furniss, M.M. 1958. Investigations of the Douglas-fir beetle, *Dendroctonus pseudotsugae Hopk.* (Coleoptera: Scolytidae) in the Intermountain Region. Progress Report, Season of 1956. Intermountain Forest & Range Experiment Station. Unpublished Report No. 3.4163, 60 pp. (pp. 18, 53)

Furniss, M.M., R.L. Livingston, and M.D. McGregor. 1981. Development of a stand susceptibility classification for Douglas-fir beetle. In: Hazard Rating Systems in Forest Insect Pest Management: Symposium Proceedings. R.L. Hedden, S.J. Barras, J.E. Coster, Eds. USDA Forest Service Gen. Tech. Rep. WO-27. pp. 115-122.

Furniss, R.L. and V.M. Carolin. 1980. Western Forest Insects. USDA Forest Service Misc. Publ. No. 1339. 654 pp. (pp. 357-359)

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth Forest Types of the Northern Region. R-1 SES 4/92; USDA Forest Service, Northern Region, Missoula, MT. 59807.

Hadfield, James S., Donald Goheen, et al. 1986. Root diseases in Oregon and Washington conifers. USDA Forest Service, Pacific Northwest Region, NW Research Station, LaGrande, Oregon. 13 pp.

Hadfield, James S. 1985. Laminated root rot: A guide for reducing and preventing losses in Oregon and Washington forests. USDA Forest Service, Pacific Northwest Region, FPM Portland, Oregon. 13 pp.

Hagle, Susan K., Scott Tunnock, Kenneth E. Gibson and Carman J. Gilligan. 1987. Field guide to diseases and insect pests of Idaho and Montana. USDA Forest Service, State and Private Forestry, Northern Region, Missoula, Montana. 123 pp.

Idaho Panhandle National Forests. Kegley, Sandra. September 1998. History of Douglas-fir Beetle Activity on the Idaho Panhandle National Forests.

Idaho Panhandle National Forests, 1998, Toward an Ecosystem Approach: An Assessment of the Coeur d'Alene River Basin. Ecosystem Paper #4, United States Department of Agriculture, Idaho Panhandle National Forests.

Kaufman, M.R., R.T. Graham, et al. 1994. An ecological basis for ecosystem management. Gen. Tech. Rep. RM-246. USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 22 pp.

Kegley, Sandra. 1998. Natural Influences of Douglas-fir Beetle Populations. Unpublished, USDA, Forest Service.

Kegley, Sandra; Randall, Carol; Jewett, Darryl' Wulff, Doug. 1999. Douglas-fir Beetle Population Surveys, Idaho Panhandle National Forests. Report 99-5, USDA Forest Service, Northern Region, Missoula, MT.

Kelley, Brian. 1998. Approximation of climax/potential vegetation zones for the Colville National Forest. In preparation.

Kaniksu National Forest Timber Management Plan, Priest River Working Circle, Idaho. 1957. pg. 50.

Kaniksu National Forest Timber Management Plan, Newport Working Circle, Washington. 1927, 1928, 1958

Kaniksu National Forest Timber Management Plan, Upper River Unit. 1927.

Lehmkuhl, John F., P.F. Hessburg, R.L. Everett, M.H. Huff and R.D. Ottmar. 1994. Historical and current forest landscapes of eastern Oregon and Washington. Part 1: Vegetation pattern and insect and disease hazards. USDA Forest Service Gen. Tech. Rep. GTR-PNW-328. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Leiberg, J. B. 1897-98. Priest River Forest Reserve. Nineteenth Annual Report of the United States Geological Survey to the Secretary of the Interior. (pp. 217-251).

Lockman, Blakey and Kenneth E. Gibson. 1998. Trip report on visit to various locations on Kootenai National Forest regarding Douglas-fir bark beetle infestations, USDA Forest Service internal letter.

Marsden, M.A., M.M. Furniss, and L.N. Kline. 1981. Modeling seasonal abundance of Douglas-fir beetle in relation to entomophagous insects and location in trees. USDA Forest Service Gen. Tech. Rep. INT-111. USDA Forest Service Intermountain Forest and Range Experiment Station, Ogden, UT. 22 pp. (pp. 3-5)

Morse, Hanley et al. January 1953. Doulas-fir beetle infestation and proposed plan aimed at its control. North Idaho and Western Montana. progress report of Task Force representing Timber Industry, Bureau of Entomology and Plant Quarantine, and U.S. Forest Service of the USDA. Missoula, Montana. 42 pp.

Mutch. Robert W. 1992. Sustaining forest health to benefit people, property, and natural resurces. In: Americn forestry--an evolving tradition, proceredings fo the 1992 Society of American Foresters national convention; 1992 Octtober 25-27; Richmond, VA. Bethesda, MD; Society of Americn Foresters: 126-131

O'Laughlin, J. et al. December 1993. Forest Health Conditions in Idaho. Idaho Forest, Wildlife and Range Experiment Station. John C. Hendee, Director. Report No. 11 (p. 166).

Quigley, Thomas M., and Arbelbide, Sylvia J. 1997. An Assessment of the Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins, USDA Forest Service, Pacific Northwest Research Station. Portland, OR. Volume III, pg. 1340.

Region 1, USDA Forest Service. Landscape Ecology Peer Group, 1997. Biophysical Classification: Habitat Groups and Descriptions, Finalized in 1997. United States Department of Agriculture, Missoula, Montana.

Schmid, J.M. et al. 1993. Phloem Temperatures in Mountain Pine Beetle-Infested Ponderosa Pine. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Note RM-521. 10 pp. (p. 1)

Schmidt, Wyman C., Shearer, Raymond C., 1995. Larix Occidentalis: a Pioneer of the North American West; from Ecology and Management of Larix Forests: A Look Ahead, General Technical Report GTR-INT-319. USDA, Forest Service, Intermountain Research Station, Ogden, UT.

Schmidt, Wyman C., Shearer, Raymond C., Roe, Arthur L., 1976. Ecology and Silviculture of Western Larch Forests, page 14. Technical Bulletin No. 1520, United States Department of Agriculture.

Schmitz, Richard E. and Kenneth E. Gibson. 1996. Douglas-fir Beetle. USDA Forest Service, Insect and Disease Leaflet 5. 8 pp.

Schultz, E. 1995. Revised Screening Direction Memo. Colville National Forest, Colville, WA.

Schwandt, John. December 15, 1998. Keypoints from information sharing regarding the Douglas-fir beetle management alternatives with accompanying letter from Byler dated 2-17-99.

Seidel, K. W. and P.H. Cochran. 1981. Silviculture of mixed conifer forests in eastern Oregon and Washington. USDA Forest Service Gen. Tech. Rep. PNW-121. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. 70 pp.

Smith, Jane Kupler and William C. Fischer. 1993. Fire ecology in northern Idaho. USDA Forest Service Gen. Tech. Rep. INT-GTR-383. USDA Forest Service, Intermountain Research Station, Ogden, UT. (pp. 10, 50, 51, 56, 57)

Steele, R. et al. 1981. Forest habitat types of central Idaho. USDA Forest Service Gen. Tech. Rep. INT-218. Intermountain Research Station, Ogden, UT

Strong, Clarence C. and Clyde S. Webb. 1970. White pine: King of many waters. Mountain Press Publishing Company, Missoula, MT.

Thies, Walter and Rona N. Sturrock. 1985. Laminated root rot in western North America. USDA Forest Service Gen. Tech. Rep. PNW-GTR-349. USDA Forest Service Pacific Northwest Research Station, Portland, OR. In cooperation with: Natural Resources Canada, Canadian Forest Service, Pacific Forestry Center. 32pp.

USDA Forest Service. 1995d. Pacific Northwest Region Regional Forester's Forest Plan Amendment #2: Revised Interim Standards for Timber Sales on Eastside Forests. Pacific Nothwest Region, Portland, OR.

USDA Forest Service. 1995. New Moon Ecosystem Analysis at the Watershed Scale. Colville National Forest, Newport Ranger District, Newport, WA.

USDA Forest Service. 1998. Vegis and Activity Database. Colville National Forest, Newport Ranger District, Newport, WA.

Washington State. 1936. Forest Type Map. Forest Survey Staff, H.J. Anndrews and R.W. Cowlin..

Williams, Clint K., Brian F. Kelley, Bradley G. Smith, and Terry R. Lillybridge. 1995. Forested plant associations of the Colville National Forest. R6-ECOL-Technical Paper 000-00 Draft Desk Guide. USDA, Forest Service, Pacific Northwest Region, Portland, OR. 369 pp.

Zack, Arthur C. 1994. Early Succession in Western Hemlock Habitat Types of Northern Idaho. Doctoral Dissertation. University of Idaho, Moscow, ID. 297 pp.

Zack, A. C. et al. 1994b. Fire history on the Idaho Panhandle National Forests. Coeur d'Alene, Idaho: USDA Forest Service, Idaho Panhandle National Forests. 44 pp. (p. 24)

Zack, Arthur C. 1999. Personal communication with Teresa Catlin.

Following is a list of data sources used to assess the range of historic vegetation conditions in the forests of northern Idaho (but not referenced in the EIS itself):

Gannett, Henry. 1902. The Forests of Oregon. In: U.S. 57th Congress, 2nd Session, House of Representatives, Document No. 212: Professional Paper No. 4, Series H, Forestry 1, Department of the Interior, United States Geologic Survey, Charles D. Wolcott, Director. Washington, DC: U.S. Government Printing Office. 36 p.

Gannett, Henry. 1902. The Forests of Washington -- A Revision of Estimates. In: U.S. 57th Congress, 2nd Session, House of Representatives, Document No. 213: Professional Paper No. 5, Series H, Forestry 2, Department of the Interior, United States Geologic Survey, Charles D. Wolcott, Director. Washington, DC: U.S. Government Printing Office. 38 p.

Kirkwood, J. E. 1910. Notes on observations in National Forests and elsewhere during the summer of 1910. On file at Supervisor's Office, Idaho Panhandle National Forest, Coeur d'Alene, ID. 41 p.

Kirkwood, J. E. 1922. Forest distribution in the Northern Rocky Mountains -- University of Montana Studies. Bulletin No. 247 --- State University Studies Series No. 2. Missoula, MT: State University. 180 p.

Larsen, J. A. 1921(?). Natural reproduction on burns -- Progress report on studies on the Coeur d'Alene National Forest. RS: Mr-1, D-1. (possibly Rocky Mountain Research Station publication?). On file at Supervisor's Office, Idaho Panhandle National Forest, Coeur d'Alene, ID. 63 p.

Leiberg, John B. 1897. General report on a botanical survey of the Coeur d'Alene Mountains in Idaho during the summer of 1895. Contributions from the U.S. National Herbarium, Vol. V, No. 1, Issued January 25, 1897. U.S. Dept. of Agriculture, Division of Botany. Washington, DC: U.S. Government Printing Office. 85 p.

Leiberg, John B. 1899. Present conditions of the forested areas in northern Idaho outside the limits of the Priest River Forest Reserve and north of the Clearwater River. In: Nineteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1897-98, Charles D. Wolcott, Director: Part V -- Forest Reserves, Henry Gannett, Chief of Division of Geography and Forestry. Washington, DC: U.S. Government Printing Office. 14 p.

Leiberg, John B. 1899. The Priest River Reserve. In: Nineteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1897-98, Charles D. Wolcott, Director: Part V -- Forest Reserves, Henry Gannett, Chief of Division of Geography and Forestry. Washington, DC: U.S. Government Printing Office. Pgs. 217-252.

Leiberg, John B. 1900. Sandpoint Quadrangle, Idaho. In: chapter by Gannett, Henry, Classification of lands. In: U.S. 56th congress, 2nd Session, House of Representatives, Document No. 5: Annual Reports of the Department of the Interior For the Fiscal Year Ended June 30, 1900 -- Twenty-First Annual Report of the United States Geologic Survey, Charles D. Wolcott, Director, Part V. Washington, DC: U.S. Government Printing Office. Pgs. 583-595.

Losensky, B. John. 1993. Historical vegetation in Region One by climatic area. (Draft report -- on file in Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region, Regional Office).

Mehringer, Peter J. Jr. 1985. Late-quaternary pollen records from the Interior Pacific Northwest and Northern Great Basin of the United States. In: Bryant, V. M., Jr. and Holloway, R. G., eds. Pollen records of late-Quaternary North American sediments. Dallas, TX: American Association of Stratigraphic Palynologists; 1985: 167-189.

Mullan, John, Capt. 1863. Report on the construction of a military road from Fort Walla-Walla to Fort Benton. Washington, DC: U. S. Government Printing Office.

Quigley, Thomas M.; Arbelbide, Sylvia J., tech. eds. 1997. An Assessment of Ecosystem Components In the Interior Columbia Basin and Portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 vol.

Rockwell, F. I. 1917. Western white pine -- Part I: the tree and the stand. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District, Office of Silviculture. 215 p. + appendices.

Smith, Jane Kapler; Fischer, William C. 1997. Fire ecology of the forest habitat types of northern Idaho. Gen. Tech. Rep. INT-GTR-363. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 142 p.

Stevens, Issac I. 1855. Narrative and final report of explorations for a route for a Pacific railroad near the forty-seventh and forty-ninth parallels of northern latitude from St. Paul to Puget Sound -- Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean: made under the direction of the Secretary of War, in 1853-5. Washington, DC: 36th Congress, 1st Session, U.S. House of Representatives, Ex. Doc. No. 56.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station. 1937. Forest Statistics: Boundary County, Idaho. Forest Survey Release No. 6, A July 1937 Progress Report. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station. 30 p.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station. 1937. Forest Statistics: Bonner County, Idaho. Forest Survey Release No. 7, An August 1937 Progress Report. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station. 31 p.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station. 1950. Forty Years of Forest Research In The Northern Rocky Mountain Region. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station. 62 p.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 1913. Working Plan: Kaniksu National Forest. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. Large folio of approximately 40 sheets of text, maps, and tables.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 1923. Management and Cutting Plan: Coeur d'Alene National Forest. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 61 p. + 14 p. apprendices.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 1924. Management Plan: Western Working Circle, Cabinet National Forest. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 17 p. + appendices, tables, & maps.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 1927. A Management Plan for the Priest River Working Circle, Kaniksu National Forest. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 22 p.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 1929. Management Plan for Bonners Ferry Working Circle, Pend Oreille National Forest, Idaho. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 37 p. + appendices, tables, & maps.

U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 1929. Forest statistics and maps: Northern Rocky Mountain District. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Rocky Mountain District. 58 p.

U.S. Department of Agriculture, Forest Service, Region 1. 1936. Management Plan: Coeur d'Alene National Forest, 1936. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 33 p. + numerous tables, graphs, and maps.

U.S. Department of Agriculture, Forest Service, Region 1. 1940. Tabulation of Timber Resources: Kaniksu Forests -- East Part Division. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. Data tables: sheets 1-13.

U.S. Department of Agriculture, Forest Service, Region 1. 1957. Timber Management Plan: Bonners Ferry Working Circle, Kaniksu National Forest, Idaho. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 86 p. + maps.

U.S. Department of Agriculture, Forest Service, Region 1. 1957. Timber Management Plan: Priest River Working Circle, Kaniksu National Forest, Idaho. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 88 p.

U.S. Department of Agriculture, Forest Service, Region 1. 1957. Timber Management Plan: Sandpoint Working Circle, Kaniksu National Forest, Idaho. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 79 p. + appendices, tables, & maps.

U.S. Department of Agriculture, Forest Service, Region 1. 1958. Timber Management Plan: Coeur d'Alene Working Circle, Coeur d'Alene National Forest, Idaho. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 64 p. + appendices, tables, and maps.

U.S. Department of Agriculture, Forest Service, Region 1. 1960. Timber Management Plan: Cabinet Working Circle, Kaniksu National Forest, Montana and Idaho. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 120 p. + supplementary materials.

U.S. Department of Agriculture, Forest Service, Region 1. 1963. Timber Management Plan: Coeur d'Alene Working Circle, Coeur d'Alene National Forest, Idaho, Region One, F.Y. 1965 - F.Y. 1974. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 51 p. + appendices.

U.S. Department of Agriculture, Forest Service, Region 1. 1963. Timber Management Plan: Kaniksu Working Circle, Kaniksu National Forest, Region One, F.Y. 1964 -- F.Y. 1973. Missoula, MT: U.S. Department of Agriculture, Forest Service, Region 1. 56 p. + maps, tables, & supplementary materials.

U.S. Department of Agriculture, Forest Service, Region 1. 1969. Timber Inventory Tables, Kaniksu National Forest -- 1969. Coeur d'Alene, ID: on file with U.S. Department of Agriculture, Forest Service, Region 1, Idaho Panhandle National Forest, supervisor's Office. Approximately 40 un-numbered tables.

Watt, Richard F. 1960. Second-growth western white pine stands. Technical Bulletin No. 1226. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 60 p.

Whitlock, Cathy. 1995. The history of Larix occidentalis during the last 20,000 years of environmental change. Paper in: Schmidt, Wyman C.; McDonald, Kathy J., comps. 1995. Ecology and management of Larix forests: a look ahead. Proceedings of an international symposium; 1992 October 5-9; Whitefish, MT, U.S.A. Gen. Tech. Rep. INT-GTR. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 83-90.

Zack, Arthur Charles. 1994. Early succession in western hemlock habitat types of northern Idaho. Moscow, ID: University of Idaho Library. PhD dissertation. 297 p.

Zack, Arthur C.; Morgan Penelope. 1994. Fire History on the Idaho Panhandle National Forest. Review Draft on file at the Forest Supervisor's Office, Idaho Panhandle National Forest, Coeur d'Alene, Idaho. 44 p. + appendices.

Watershed

Christner, J. and R.D. Harr. 1982. Peak streamflows from the transient snowzone, Western Cascades, Oregon. Presented at the Western Snow Conference, April 20, 1982, Reno, Nevada.

Harr, R.D. 1981. Some characteristics and consequences of snowmelt during rainfall in western Oregon. Journal of Hydrology. 53.

Kappesser, G.K. 1991. A procedure for evaluating risk of increasing peak flows from rain-on-snow events by creating openings in the forest canopy. USDA Forest Service, Idaho Panhandle National Forests.

Megahan, W.F. 1983. The hydrologic effects of clearcutting and wildfire on steep granitic slopes in Idaho. Water Resources Research 19(3).

Regional Interagency Executive Committee and the Intergovernmental Advisory Committee Ecosystem Analysis at the Watershed Scale. 1995. Federal Guide for Watershed Analysis. Version 2.2. Portland, OR.

State of Idaho Department of Health and Welfare. 1996. Rules Governing Water Quality Standards and Wastewater Treatment Requirements, Title 1, Chapter 2, Idaho Code. Division of Environmental Quality, Administrative Procedures Section. Boise, Idaho.

State of Idaho Department of Health and Welfare. 1992. Water Quality Status Report and Nonpoint Pollution Assessment 1992. Division of Environmental Quality, Boise, Idaho.

Toews, D.D.A. and M.K. Moore. 1982. "The effects of three streamside logging treatments on organic debris and channel morphology of Carnation Creek." In: Belt G.H., J.D. O'Laughlin and T. Merril. 1992. Design of forest riparian buffer strips for the protection of water quality: Analysis of scientific literature. Rpt. No.8. University of Idaho. Moscow, ID.

Troendle, C.A. and R.M. King. 1983. The effect of timber harvest on the Fool Creek watershed, 30 years later. Water Resources Research 21(12).

USDA Forest Service. February, 1998. Toward An Ecosystem Approach: An Assessment of the Coeur d'Alene River Basin. USDA Forest Service, Idaho Panhandle National Forests. Ecosystem Paper #4.

USDA Forest Service. 1993. Idaho Panhandle National Forests Guidelines for Watershed and Stream Channel Evaluations and Project Implementation. Idaho Panhandle National Forests, Coeur d'Alene, ID.

Wildlife

Bartelt, Paul E. and Charles R. Peterson. Final Report. Riparian Habitat Utilization by Western Toads *(Bufo boreas)* an spotted frogs *(Rana pretiosa)* on the Targhee National Forest. Idaho Museum of Natural History. 1994.

Bull, E.L., C.G. Parks, and T.R. Torgersen. 1997. Trees and logs important to wildlife in the Interior Columbia River Basin. Gen. Tech. Rep. PNW-GTR-391. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. p. 28.

Bull, Evelyn. 1997. Trees and logs important to wildlife in the Interior Columbia River Basin. USDA Forest Service General Technical Report PNW-GTR-391.

Bull, E.L. and B. Carter. 1993. Summary of pileated woodpecker monitoring in eastern Oregon, 1992. Unpub. Monitoring Rep. 8 pp.

Bull, E.L., and R.S. Holthausen. 1993. Population density, home range size, and habitat use of pileated woodpeckers in eastern Oregon. USDA Forest Service, Pacific Northwest Research Station, La Grande, Oregon.

Bull, E. L. 1987. Ecology of the pileated woodpecker in northeastern Oregon. J. Wildl. Manage. 51:472-481.

Bull, E. L. and E.C. Meslow. 1977. Habitat requirements of the pileated woodpecker in northeastern Oregon. J. of For. 75:335-337.

Butts, Thomas W. 1992. Wolverine (*Gulo gulo*) biology and management: A literature review and annotated bibliography. USDA Forest Service, Northern Region, Missoula, MT.

Cassirer, E. Frances. 1998. Personal communication regarding the potential for impacts on Coeur d'Alene salamander and the benefits from operating during the dry season.

Cassirer E. Frances, J.D. Reichel, R.L. Wallen, and E.C. Atkinson. 1996. (Draft) Harlequin Duck (*Histrionicus histrionicus*) USDA Forest Service/Bureau of Land Management habitat conservation assessment and conservation strategy for the U.S. Rocky Mountains.

Cassirer, E. F. and C.R. Groves. 1993. Conservation assessment for the Coeur d'Alene Salamander *Plethodon idahoensis*. USDA Forest Service. Region 1.

Cassirer, Francis E. and C.R. Groves. 1991. Harlequin Duck ecology in Idaho: 1987-1990. Idaho Department of Fish and Game, Boise, Idaho.

Crenshaw, J.G. 1987. Effects of the Cabinet Gorge Kokanee Hatchery on wintering bald eagles in the lower Clark Fork River and Lake Pend Oreille, Idaho. U.S. Department of Energy, Bonneville Power Administration, Portland, OR. 82 p.

Corkran, C. and Chris Thoms. 1996. Amphibians of Oregon, Washington, and British Columbia. Lone Pine Press.

Crocker-Bedford, D.C. and B. Chaney. 1988. Characteristics of goshawk nesting stands. Pages 210-217 in R.L. Glinski et al., editors. Proc. Southwest Raptor Management Symposium. Natl. Wildlife Federation, Washington D.C. 295 pp.

DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and rangeland birds of the United States natural history and habitat use. USDA Forest Service. Agricultural Handbook 688.

Dobkin, D. S. 1994. Conservation and management of neotropical migrant landbirds in the Northern Rockies and Great Plains. University of Idaho Press. Moscow, ID.

Dobkin, D.S. 1992. Neotropical migrant landbirds in the Northern Rockies and Great Plains. USDA Forest Service Northern Region. Publication No. R1-93-34. Missoula, Montana.

Frederick, G.P. 1991. Effects of forest roads on grizzly bears, elk, and gray wolves: A literature review. USDA Forest Service, Kootenai National Forest, Libby MT.

Friedmann, H. and L.F. Kiff. 1985. The parasitic cowbirds and their hosts. Proceedings: Western Foundation Zoology 2:226-304. In: Robinson, Scott, et al. 1992. Management Implications of Cowbird Parasitism on Neotropical Migrant Songbirds. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. pp. 93-102.

Groves, C. 1988. Status and Distribution of the Coeur d'Alene salamander (*Plethodon vandykei idahoensis*) in Idaho. Idaho Natural Heritage Program, Non-game program. Idaho Department of Fish and Game, Boise, ID.

Groves, C. 1987. Distribution of the wolverine (*Gulo gulo*) in Idaho. Idaho Natural Heritage Program, Non-game program, Idaho Department of Fish and Game.

Hansen, J. 1986. Wolves of Northern Idaho and Northeastern Washington. MT Coop. Wildl. Res. Unit, USDI Fish and Wildlife Service. 88 pp.

Harris, Mary A. 1982. Habitat use among woodpeckers in forest burns. M.S. thesis, University of Montana. In: Black-backed woodpecker notes compiled by Jenny Taylor, Bonners Ferry Ranger District. USDA Forest Service, Idaho Panhandle National Forests.

Hayden, Jim. Idaho Fish and Game Biologist. December 1998. Personal Communication with Kristen Philbrook and Sherri Lionberger.

Hayden, J. 1998. Idaho Department of Fish and Game. Personal communication.

Hayward, G.D., and J. Verner, tech. editors. 1994. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. Gen. Tech. Rep. RM-253. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 214 pp.

Hayward, G.D. 1989. Habitat use and population biology of boreal owls in the northern Rocky Mountains, USA. PhD dissertation. University of Idaho, Moscow, ID.

Hayward, G.D. 1989. Boreal Owl Habitat Relationships: A Report to Region I, U.S. Forest Service.

Hayward, G.D., P.H. Hayward, and E.O. Garton. 1987. Habitat requirements and distribution of the boreal owl in central Idaho. Annual Progress Rep. of Fish and Wildlife Resources. College of Forestry, Wildlife, and Range Sciences. University of Idaho. Moscow, ID. 11 pp.

Heinemeyer, K.S. and J.L. Jones. 1994. Fisher biology and management: a literature review and adaptive management strategy. USDA Forest Service Northern Region, Missoula, MT. 108 pp.

Hornocker, M.G. and H.S. Hash. 1981. Ecology of the Wolverine in northwestern Montana. Canadian Journal of Zoology. 5 9: 1286-1301.

Hunter, M., Jr. 1990. Wildlife, forests and forestry: Principles of managing forests for biological diversity. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Hutto, Richard L. November 1995. USDA Forest Service Northern Region Songbird Monitoring Program Distribution and Habitat Relationships. USDA Forest Service contract #R1-95-05. Second Report. Division of Biological Sciences. University of Montana. 21 pp.

Interagency Grizzly Bear Committee. 1998. Task Force report on grizzly bear / motorized access management.

Jackman, Siri Marion. 1975. Woodpeckers of the Pacific Northwest: Their characteristics and their role in the forests. M.S. thesis, Oregon State University. In: Black-backed woodpecker notes compiled by Jenny Taylor, Bonners Ferry Ranger District. USDA Forest Service, Idaho Panhandle National Forests. 147 pp.

Jageman, H. 1884. White-tailed deer habitat management guidelines. Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, Idaho. 14 p.

Jones, Jeffrey L., 1991. Habitat Use of Fisher in North Central Idaho. Unpublished thesis, University of Idaho, Moscow, Idaho.

Kimball et al. 1996. White-headed Woodpecker: *Picoides albolarvatus*. The Birds of North America, No. 252. The American Ornithologist's Union, Washington D.C. 24 pp.

Koehler, G.M. 1987. The Ecology on the Lynx (Lynx canadensis) in North Central Washington. WL Res. Inst. Progress Report. 25 pps.

Koehler, G.M. 1988. Demographic Characteristics and Habitat Requirements of Lynx (Lynx canadensis) in North Central Washington. 71 pps.

Koehler, G.M. and K.B. Audrey. 1994. Lynx in the Scientific Basis for Conservating Forest Carnivores in the Western United States. p 74-98 *in* Ruggiero, L.F.; Aubry, K.B.; Buskirk, S.W.; Lyon, L.J.; and Zielinski, W.J. 1994. Scientific Basis for Conservating Forest Carnivores in the Western United States: American Marten, Fisher, Lynx and Wolverine. USDA Forest Service, Rocky Mountain Forest and Range Exp. St. Gen Tech. Report RM-254. 184 p.

Koehler, G.M. and M.G. Hornocker. 1977. Fire Effects on Marten Habitat in the Selway-Bitteroot Wilderness. J. Wildl. Manag. 41(3); 500-505. *in* Warren, N., tech. editor. 1990. Old growth habitats and associated wildlife species in the northern Rocky Mountains Northern Region Report RI-90-42: USDA Forest Service. Missoula, MT. 47 p.

Layser, E.F. 1978. Grizzly bears in the southern Selkirk Mountains. Northwest Science. Vol (52) pp. 71-91.

Leege, T.A. 1984. Guideline for Evaluating and Managing Summer Elk Habitat in Northern Idaho. Wildlife Bulletin No. 11, Idaho Department of Fish and Game.

Loeffler, Chuck. Editor. Boreal toad and conservation plan and agreement for the management and recovery of the southern Rocky Mountain population of the boreal toad *(Bufo boreas boreas)*. Report prepared by the Boreal Toad Recovery Team and Technical Advisory Group. 1998.

Lyon, L. Jack, and Alan G. Christensen. 1992. A partial glossary of elk management terms. Gen. Tech. Rep. INT-288. USDA Forest Service, Intermountain Research Station, Ogden, UT.

McClelland, B. R. 1979. The pileated woodpecker in forests of the northern Rocky Mountains. pp. 283-299 In: The role of insectivorous birds in forest ecosystems. Academic Press.

Montana Bald Eagle Working Group. 1991. Habitat management guide for bald eagles in northwestern Montana. 29 p.

Moore, T.L. and G.P. Frederick. 1991. Distribution and Habitat of Flammulated Owls (*Otus flammeolus*) in West-Central Idaho. Conservation Data Center, Nongame and Endangered Wildlife Program, Bureau of Wildlife. Idaho Department of Fish and Game.

Mousseaux, M. 1995. Unpublished document, TES Plant habitat queries by guilds.

Nigorson, D.W. and Marc Brigham. 1993. Bats of British Columbia.

Notes on Montana Bats. January 1992. DLG: B: Bats.FS

Nussbaum, Ronald A., Edmund D. Brodie Jr., and Robert M. Storm. Amphibians and reptiles of the Pacific Northwest. 1983. University of Idaho Press, Moscow, ID.

Palmer, D.A. 1986. Habitat selection, movements and activity of boreal and saw-whet owls. M.S. Thesis. Colorado State Univ. Fort Collins, Colorado, USA.

Patton, Tim, and Ron Escano. Marten Habitat Relationships. pp29-41 *in* Warren, N., tech. editor. 1990. Old growth habitats and associated wildlife species in the northern Rocky Mountains Northern Region Report RI-90-42: USDA Forest Service. Missoula, MT. 47 p.

Pauley, G. 1990. Habitat use, food habits, home range, and seasonal migration for white-tailed deer in the Priest River Drainage, Northern Idaho. M.S. Thesis, University of Idaho, Moscow. 153 p.

Perkins, Mark J. April 1992. Piecotus Townsendii survey for the Nez Perce National Forest. Idaho Department of Fish and Game. 1 p.

Pfingsten, B. 1983. Evaluating wild ungulate habitat: use of fogate quality as a relative index. Western Wildlands. 9: 24-27 p.

Powell, Roger A. 1982. The fisher: life history, ecology and behavior. University of Minnesota Press, Minnesota. 217 p.

Powell and Zielinski. 1994. Ch. 3 in "Scientific basis for conserving forest carnivores in the western United States". USDA Forest Service Gen. Tech. Rep. RM-254.

Quigley, T.M., R.W. Haynes, and R.T. Grahm. 1996. Integrated Scientific Assessment for Ecosystem management in the interior Columbia Basin and Portions of the Klamath and Great Basins. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 303p.

Raphael, M.G., and M.L. Morrison, and M.P. Yoder-Williams. 1987. Breeding bird populations during twenty-five years of post-fire succession in the Sierra Nevada. Condor 89: 614-626.

Reichel, J.D. and S.G. Beckstrom. 1993. Northern Bog Lemming Survey 1992. Report to the Kootenai National Forest. Montana Natural Heritage Program. Helena, MT. 44 p.

Reynolds, R.T., and B.D. Linkhart. 1992. Flammulated owls in ponderosa pine: pages 166-169 *in* Old-growth forests in the southwest and Rocky Mountain regions; proceedings of a workshop. USDA Forest Service Gen. Tech. Report RM-213.

Reynolds, R.T., R.A. Ryder and B.D. Linkhart. 1989. "Small forest owls" In: Proceedings of the Western Raptor Management Symposium and Workshop. National Wildlife Federation Scientific and Technical Series No. 12.

Reynolds, R.T. 1983. Management of western coniferous forest habitat for nesting Accipiter hawks. USDA Forest Service Gen. Tech. Rep. RM-102. 7 pp.

Ritter, Sharon (Neomigrant Coordinator, State of Idaho). 1997. Personal communication with Gail Worden, USDA Forest Service Biologist.

Robinson, Scott, BLM Wildlife Biologist. December 1998. Personal Communication with Kristen Philbrook, USDA Forest Service Wildlife Biologist.

Robinson, Scott, BLM Wildlife Biologist. April 1999. Personal Communication with Sandy Jacobson, USDA Forest Service Biologist.

Robinson, Scott, et al. 1992. Management Implications of Cowbird Parasitism on Neotropical Migrant Songbirds. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. pp. 93-102.

Ruggiero, L.F., et al. tech. eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States. Gen. Tech. Rep. RM-254. Ft. Collins CO: USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 p.

Stalmeister, Kaiser. 1997. Flushing Responses of wintering bald eagles to military activity. Journal of Wildlife Management 61(4): 1307-1313.

State of Idaho Department of Fish and Game, Nez Perce Tribe, Sawtooth National Forest. 1995. (Draft) Forest carnivores in Idaho; Habitat conservation assessments (HCAs) and conservation strategies (CSs). The Idaho State Conservation Effort.

State of Idaho Department of Fish and Game, Idaho Department of Parks and Recreation, Bureau of Land Management, Regions 1 and 4 of USDA Forest Service, and USDA Fish and Wildlife Service. 1995a. (Draft) White-headed woodpecker *(Picoides albolarvatus)* in Idaho; Habitat conservation assessment (HCA) and conservation strategy (CS). The Idaho State Conservation Effort.

Stock, Chuck. 1999. U.S. Forest Service Wildlife Biologist Personal Communication with Kristen Philbrook, U.S Forest Service Wildlife Biologist.

Sturtz, S. Coeur d' Alene Audubon Society Member. December 1998. Personal Communication with Kristen Philbrook, USFS Wildlife Biologist.

Thomas, J.W., tech. editor. 1979. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. Agricultural Handbook No. 553. Pacific Northwest Forest and Range Experimentation Station, USDA Forest Service, Portland, OR. 512 p.

Tucker, P.A., D.L. Davis, and R.R. Ream. 1990. Wolves: Identification, documentation, population monitoring and conservation considerations. Northern Rockies Natural Resource Center of the National Wildlife Federation, Missoula, MT.

USDA Idaho Panhandle National Forest Plan 1987.

USDA Forest Service. 1997a. Integration of forest planning into ecosystem management: Toward a forest ecosystem approach: An assessment for the St. Joe Area. Ecosystem Team Paper #3. Idaho Panhandle National Forests, Coeur d' Alene, ID.

USDA Forest Service. 1997b. Lynx Conservation Strategy. Lynx White Paper. Kootenai National Forest, Libby, MT.

USDA Forest Service. 1996. USDA Forest Service and BLM conservation strategy for forest-dwelling species in Idaho (Draft).

USDA Forest Service. 1996a. Draft - terrestrial ecosystem - vegetation and landscape ecology. Ecological concepts as applied to the St. Joe geographic area. Idaho Panhandle National Forests. Idaho Panhandle National Forests, Coeur d'Alene, ID. 14 pp.

USDA Forest Service. 1995e. Reserve Tree Guide. Idaho Panhandle National Forests, Coeur d'Alene, ID. 14 pp.

USDA Forest Service. 1995. Letter to Forest Supervisors in Regions 1, 4, and 6 transmitting a streamlining process for dealing with sensitive species and to clarify conclusions of effects for listed, proposed, and sensitive species. 22 p.

USDA Forest Service. 1992. Interim management recommendations: Sensitive species. Bill Ruediger: Region 1 TES Species Program Manager. USDA Forest Service, Missoula, MT.

USDA Forest Service. 1992a. Interim management recommendations for sensitive species, USDA Forest Service, Northern Region, Missoula, MT.

USDA Forest Service. 1992b. Letter and Enclosure dated May 15, 1992: interpretation of FSM 2670.

USDA Forest Service. 1991. Updated northern region sensitive species list. Northern Region, Missoula, MT.

USDA Forest Service. 1990. Old-Growth habitat and associated wildlife species in the Northern Rocky Mountains. Northern Region Wildlife Habitat Relationships Program.

USDA Forest Service. 1989. Caring for our natural community. Northern Region, Missoula, Montana.

USDI Fish and Wildlife Service. 1994. Selkirk Mountain Caribou Recovery Plan. Portland, OR. 63 p.

USDI Fish and Wildlife Service. 1993. Selkirk Mountain Wooland Caribou Recovery Plan. Portland, OR. 59p.

USDI Fish and Wildlife Service. 1993. Grizzly Bear Recovery Plan. Missoula, MT. 181p.

USDI Fish and Wildlife Service. 1992. Letter containing guidelines for species lists.

USDI Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. Denver, CO. 119 pp.

USDI Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. Denver, CO

USDI Fish and Wildlife Service. 1979. Bald Eagle Management Guidelines for Oregon and Washington. 7 pps.

Warren, N., tech. editor. 1990. Old growth habitats and associated wildlife species in the northern Rocky Mountains. Northern Region Report R1-90-42: USDA Forest Service, Missoula, MT. 47 pp.

Weaver, John. Conservation Biologists, Wildlife Conservation Society. August, 1998. Personal Communication with Kristen Philbrook and Gail Worden, US Forest Service Biologists.

Wilson, Albert G. Jr., 1991. A Survey of the Avery Ranger District, Idaho Panhandle National Forest, for the Coeur d'Alene salamander (Plethodon idahoensis). Idaho Department of Fish and Game.

Wilson, Albert G. Jr., 1992. A Survey of the St. Maries and Sandpoint Ranger Districts, Panhandle National Forest, for the Coeur d'Alene salamander (Plethodon idahoensis). Idaho Department of Fish and Game.

Wisdon, M.J. 1997. Source Habitats for terrestrial vertebrates of focus in the interior Columbia Basin: broad scale trends and management implications. (in press).

LIST OF PREPARERS

STEERING COMMITTEE

The EIS Project and Assessment Teams were provided with guidance and oversight in order to provide a consistent approach to the treatment of the Douglas-fir beetle infestation. The people who provided this guidance are identified as members of the Steering Committee.

Team Member	Title	Home Office
Aguilar, Pat	Deputy Forest Supervisor	IPNF SO
Bain, George	District Ranger	St. Joe RD
Byler, Jim	Forest Health Protection Field Office Supervisor	Northern Region, at the Coeur d'Alene Field Office (IPNF SO)
Dallas, Dan	District Ranger	Colville NF, Newport RD
Dillard, Dave	District Ranger	Sandpoint RD
Dunstan, Kent	District Ranger	Priest Lake RD
Gilbert, Brad	Supervisory Forester, Operations Team Leader	IPNF SO
Johnson, Steve	Supervisory Forester, NEPA Coordinator	IPNF SO
Matthews, J. Anthony	Forester	IPNF SO
Matthews, Susan	District Ranger	Coeur d'Alene River RD
Rahm, Gary	Supervisory Forester, Ecosystem Team Leader	IPNF SO
Wright, Dave	Forest Supervisor	IPNF SO
Zieroth, Elaine	District Ranger	Bonners Ferry RD

EIS PROJECT TEAM MEMBERS

The team members primarily responsible for the analysis and documentation associated with this environmental impact statement are identified below.

Table LP-1. Interdisciplinary Team members and support.

Team Member	Title	Qualifications	Team Role	Home Office
Dennis Adams	Engineer	B.S. Engineering; USDA FS, 27 years	Transportation Planning	CDA River RD
Kerry Arneson	Writer-Editor	USDA FS, 19 years	Writer-Editor, Public Comment Analysis	CDA River RD
David Asleson	Supervisory Forester	B.A. History, M.A. Geography, M.A. Forestry; USDA FS, 26 years	Scenery analysis and support, Response to Comments	Priest Lake RD
Ben Bannister	Lead Forestry Technician	B.S. Wildlife Biology; USDA FS, 8 years	Fire/Fuels analysis support	CDA River RD
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Diana Baxter	Public Affairs Assistant	B.A. Communications; USDA FS, 26 years	Content Analysis	Colville NF, SO
Pat Behrens	Forester	B.S. Forestry; BLM & USFS 17 yrs	Silviculture	Bonners Ferry RD
Suzanne Burnside	Resource Assistant	USDA FS, 12 years	Writer-Editor	IPNF SO
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Camilla Cary	Computer Data Base Manager	USDA FS, 7 years	Public Comment Analysis	Priest Lake RD
Teresa Catlin	Ecologist	B.S. Animal Sciences, M.S. Forest Resources; USDA FS, 10 years	Newport RD Liaison, Ecologist, Vegetation analysis	Newport RD, Colville NF
Dave Cobb	Forester	B.S. Forestry Management; M.S. Forestry Management; USDA FS 10 years	Operations	Priest Lake RD
Jill Cobb	Hydrologist	B.A. Geography & Ecosystems Analysis, M.S. Watershed Management; USDA FS 15 years	Hydrology analysis	Priest Lake RD
Kent Contreras	Forestry Technician	A.A. Fire Management; USDA FS, 17 years	Fuels analysis	Newport RD
Terri Contreras	Cartographic Tech.	B.S. Forestry; USDA FS, 10 years	GIS support	Newport RD
Kevin Davis	Hydrology Tech	B.A. Biology/Geology; USDA Forest Service, 6 years	Hydrology analysis support	Sandpoint RD
Shanda Dekome	Fisheries Biologist	B.A. Wildlife, M.S. Fisheries; USDA FS, 12 years	Fisheries analysis	Sandpoint RD
Ron Deon	Biology Technician	USDA FS, 25 years	Wildlife analysis support	CDA River RD
Dale Deiter	Fisheries Hydrologist	B.S. Forestry, M.S. Forestry; USDA FS, 19 years	Hydrology support	Priest Lake RD

Team Member	Title	Qualifications	Team Role	Home Office
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Cameo Flood	Forester	B.S. Forestry; USDA FS, 11 years	Team Leader Liaison	St. Joe RD
Gary Ford	Soils Scientist	B.S. Earth Sciences; M.S. Earth Sciences; Ph.D. Soil Science; USDA FS, 18 years	Process Manager, Public Comment Analysis, Monitoring and Implementation,	IPNF SO
Ted Geier	Hydrologist	B.S. Forest Mgmt; M.A. Public & Environmental Policy; PhD. Forest Hydrology and Water Quality; USDA FS, 6 years	Hydrology	CDA River RD
Nancy Glines	Soil Scientist	B.S. Soil Science and Plant Nutrition; USDA FS, 23 years	Writer-Editor	Newport RD
Val Goodnow	Botanist	B.S. Biology; USDA FS, 16 years	Botany, Noxious Weeds	CDA River RD
Mark Grant	Forestry Technician	A.A. Forest Technology; USDA FS, 25 years	Fire and Fuels	IPNF SO
Tracy Gravelle	Forester	B.S. Forest Engineering; USDA FS 19 years	EIS Summary, Project Files	St. Joe RD
Don Gunter	Silviculturist	B.S. Forestry; USDA FS 29 years	Vegetation/Silviculture	Sandpoint RD
Anna E. Hammet	Biology Technician	B.A. Biology (Botany); USDA FS, 22 years	TES Plants, Noxious Weeds	Sandpoint RD
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Hadley Hawkins	IHC Asst. Sup.	B.S. Forest Resources; A.S. Wildland Fire Management; USDA FS, 10 years	Fire/Fuels, Economics analysis support	CDA River RD
Mike Herrin	Wildlife Biologist	USDA FS, 10 years	Wildlife analysis	Newport RD
Greg Hetzler	Supervisory Forester	B.S. Recreation; USDA FS 23 years	Visuals and Recreation	Sandpoint RD
Kathie Hinson	Forester	B.S. Forestry; USDA FS, 10 years	Writer-Editor, Soils Support	Sandpoint RD
Dan Jackson	Civil Engineer Tech.	USDA FS, 17 years	Engineering and Roads	Priest Lake RD
Chris Jacobson	Information Resources Manager	B.S. Forestry; USDA FS, 21 years	GIS Analysis Support	Bonners Ferry RD
Sandra Jacobson	Wildlife Biologist	B.A. Zoology, M.S. Nat Res - Wildlife; USDA FS, 21 years	Wildlife	Bonners Ferry RD
Terrie Jarrell	Civil Engineer	B.S. Environmental Engineering, M.S. Resource Conservation; USDA FS, 10 years	Transportation planning, hydrology support	CDA River RD
Sarah Jerome	Lead Forestry Technician	B.S. Forest Products; USDA FS, 7 years	Fire/Fuels analysis support	CDA River RD

Team Member	Title	Qualifications	Team Role	Home Office
Darryl Jewett	Entomologist	B.S. Forest Biology; M.S. Entomology; Ph.D. Entomology & Ecology; USDA FS, 1 year	Entomologist	R1 @ IPNF SO
Lynn Kaney	Supervisory Forester	B.S. Forest Management; USDA FS, 24 years	Vegetation analysis	Newport RD
Sandy Kegley	Entomologist	B.S. Biology; M.S. Entomology; USDA FS, 13 years	Entomologist	R1 @ IPNF SO
Tim Layser	Wildlife Biologist	B.S. Wildlife Biology, M.S. Environmental Science - Nat Res Mgmt; USDA FS, 21 years	Wildlife analysis	Priest Lake RD
Ed Lider	Fisheries Scientist	B.S. Fisheries Management; M.S. Fisheries Management; USDA FS, 15 years	Fisheries	CDA River RD
Sherri Lionberger	Forester	B.S. Forest Engineering; USDA FS, 20 years	Team Leader, CDA River RD projects	CDA River RD
Henry Logsden	Computer Specialist	USDA FS, 20 years	GIS data and mapping	St. Joe RD
Spike Loros	Forestry Technician	USDA FS, 22 years	GIS Mapping	Bonners Ferry RD
Maridel Merritt	Writer-Editor	B.S. Agriculture; USDA FS, 23 years	Writer-Editor, Public Involvement	Bonners Ferry RD
Larry Meyer	Forestry Technician	A.A.S. Natural Resources; USDA FS, 21 years	I & D, protection project liaison, KV plan & Restoration Database	Priest Lake RD
Barbara Montgomery	Forestry Technician	USDA FS, 22 years	GIS data and mapping	St. Joe RD
Mark Mousseaux	Botanist	B.S. Forest Resources; M.S. Forest Science; USDA FS, 10 years	Botany	IPNF SO
Jerry Neihoff	Soils Scientist	B.S. Soil Science; M.S. Forest Resources; USDA FS, 24 years	Soils	IPNF SO
Lonnie Newton	Forestry Technician	B.S. Natural Resources Ecology; USDA FS, 6 seasons	EIS preparation, process coordination	IPNF SO
Stan Parks	Assistant Fire Management Officer	A.S. Forestry; B.S. Business Management; USDA FS, 20 years	Fire/Fuels, Air Quality	CDA River RD
Rick Patten	Hydrologist	B.S. Engineering; B.S. Forestry; M.S. Watershed Hydrology; USDA FS, 24 years	Hydrology	IPNF SO
Diane Penny	Biological Technician	B.S. Environmental Studies, Plant Science. and Geography; USDA FS, 10 years	Sensitive plant surveys	Priest Lake RD

Team Member	Title	Qualifications	Team Role	Home Office
Mary Ellen Pearce	Data Administration / GIS Coordinator	B.S. Forest Management; USDA FS, 20 years	GIS data and mapping	IPNF SO
Kristin Philbrook	Wildlife Biologist	B.A. Biology; M.S. Forestry; USDA FS, 6 years	Wildlife	CDA River RD
Peggy Polichio	Supervisory Forester	B.S. Renewable Natural Resources; USDA FS, 21 years	Incident Commander	IPNF SO
Bob Ralphs	Wildlife Biologist	B.S. Natural Resources; USDA FS, 24 years	Wildlife analysis	IPNF SO
Carol Randall	Entomologist	B.S. Natural Resources; M.S. Integrated Forest Health Protection; USDA FS, 9 years	Insect & Disease	IPNF SO
Carl Ritchie	Forestry Technician	B.A. Anthropology/Archaeology; USDA FS, 20 years	Soils, Heritage Resources	CDA River RD
Dave Roberts	Wildlife Biologist	B.S. Wildlife Biology; USDA FS, 23 years	Wildlife	Sandpoint RD
Brett Roper	Fisheries Biologist	B.S. Environmental Studies; M.S. Forestry; Ph.D. Fisheries; USDA FS 5 years	Fisheries	IPNF SO
John Ruebke	Hydrology Technician	A.A.S. Forest Technology; USDA FS, 18 years	Hydrology	CDA River RD
Tom Sandberg	Archaeologist	B.A. Archaeology/Anthropology USDA FS, 6 years	Cultural Resources	Sandpoint RD
Debbie Scribner	Forestry Technician	USDA FS, 25 years	Geographic Info System	Sandpoint RD
Connie Smith	Forester	M.S. Wildland Resource Science; B.S. Renewable Natural Resources; USDA FS, 23 years	Regional Liaison, EIS preparation, Writer-Editor	Colville NF SO
Karen Soenke	Supervisory Forester	B.S. Forest Management; USDA FS, 20 years	Visuals	Newport RD
Rob Steinhorst	Supervisory Forester, Timber Mgt. Assistant	B.S. Engineering Science, M.S. Forestry; USDA FS, 25 years	Monitoring and Implementation support	Bonners Ferry RD
Chuck Stock	Wildlife Biologist	B.A. Biology; USDA FS, 20 years	Wildlife analysis support	St. Joe RD
Joyce Stock	Silviculturist	B.S. Forest Resources; USDA FS, 25 years	Silvicultural support	CDA River RD
Fred Stewart	Regional Economist	B.A. Wildlife Biology; Ph.D. Economics; USDA FS 20 years	Economics	R1, Regional Office
Jake Strohmeyer	Student Trainee	USDA FS 5 years	Hydro. Support	Sandpoint RD
Jenny Taylor	Wildlife Biologist	B.A. Zoology, USDA FS, 21 years	Wildlife analysis	IPNF SO
Greg Tensmeyer	Computer Specialist	B.S. Zoology; USDA FS , 21 years	GIS data and mapping	IPNF SO

Team Member	Title	Qualifications	Team Role	Home Office
Glenn Truscott	Forester	B.S. Forestry; B.S. Wildlife Management; USDA FS, 27 years	Economics, Transporation Planning	CDA River RD
Debbie Wilkins	Forester	B.S. Forest Management, B.S. Recreation Resources Management; USDA FS, 12 years	Recreation	Priest Lake RD
Pam Wilkins	Hydro Tech	B.S. Forest Science and Wildland Recreation; USDA FS, 3 years	Hydrology support	Priest Lake RD
Monte Williams	Hydrologist	B.S. Watershed Management; USDA FS, 10 years	Hydrology	Sandpoint RD
Gail Worden	Wildlife Biologist	B.S. Wildlife Management; USDA FS, 21 years	Wildlife analysis support	CDA River RD
Judy York	Information Assistant	B.S. Wildlife, M.S. Nat Res Communication; USDA FS, 11 years	Public Involvement, Writer-Editor	Sandpoint RD
Steve Zieroth	Silviculturist	B.S. Forestry; USDA FS, 25 years	Vegetation, Silviculture	CDA River RD
Pete Zimmerman	NEPA Planning Forester	B.S. Forestry; USDA FS, 19 years	Team Leader, Priest River/Newport projects	Sandpoint RD

LIST TO WHOM COPIES OF THE DOCUMENT HAVE BEEN SENT

The following agencies, organizations, businesses and individuals were sent either the full Final EIS, the Record of Decision and Summary and maps, depending on the level of detailed information they requested. Individuals listed below received the document either in a hard copy format or electronic format via CD Rom. All participants have been given the opportunity to receive the Final EIS.

Federal Agencies

USDA FOREST SERVICE
Environmental Coordination, Washington, DC
Northern Region, Missoula, MT
Pacific Northwest Region, Portland, OR
Forest Health Protection, Boise, ID
Forest Health Protection, Missoula, MT
Medicine Bow-Routt National Forest, Steamboat Springs, CO
Kootenai National Forest, Libby, MT
Lolo National Forest, Missoula, MT
Flathead National Forest, Kalispel, MT
Clearwater National Forest, Orofino, ID

USDA Office Of Civil Rights
Policy & Planning Division, Washington, DC

USDA, National Agricultural Library
Beltsville, MD

US Environmental Protection Agency
Washington, DC
Coeur d'Alene, ID
Seattle, WA

USDA OPA Publications Stockroom
Washington, DC

USDI Fish And Wildlife Service
Spokane, WA

USDI Office Of Environmental Affairs
Washington, DC,

BC Forest Service, Research Branch,
Victoria, British Columbia

Bureau Of Land Management,
Coeur d' Alene, ID

Office Of The General Counsel
Missoula, MT

Bonneville Power Administration
Spokane,WA

Tribes

Coeur d'Alene Tribe, Plummer, ID
Kalispel Tribal Office, Usk, WA
Kootenai Tribe Of Idaho, Bonners Ferry, ID

State Agencies

Idaho

Department Of Lands, Coeur d' Alene, ID
Department Of Natural Resources, Plummer, ID
Division Of Environmental Quality, Boise, ID
Idaho Department Of Lands, Coeur d'Alene, ID
Idaho Department Of Lands, Boise, ID
Idaho Department Of Lands, Coolin, ID
Idaho Department of Fish And Game, Coeur d' Alene, ID
State Historic Preservation Office, Boise, ID
Idaho Department of Environmental Quality, Coeur d' Alene, ID
Idaho Parks And Recreation, Boise, ID

Washington

Washington Dept Of Natural Resources, Colville, WA
Washington Dept Of Wildlife, Spokane, WA
Washington State Dept Of Wildlife, Spokane, WA

Oregon

Oregon Department Of Forestry, Salem, OR

Libraries/Colleges

Spokane Public Library, Spokane, WA
Spokane Valley Library, Spokane, WA
Spokane Falls Community College, Spokane, WA
Priest River City Library, Priest River, ID
Colorado State University Libraries, Fort Collins, CO
Coeur d'Alene Public Library, Coeur d'Alene, ID
Colville Public Library, Colville, WA
East Bonner County Library, Sandpoint, ID
Kellogg Public Library, Kellogg, ID
Pend Oreille County Library, Newport, WA
WSU, Program Of Environmental Science, Pullman, WA

Cities

Newport Chamber Of Commerce
Coeur d'Alene Chamber Of Commerce
Priest Lake Chamber Of Commerce

Sandpoint Chamber Of Commerce
Wallace Chamber Of Commerce

Counties

Bonner County Commissioners Sandpoint, ID
Bonner County Road & Bridge Dept, Sandpoint, ID
Boundary County Commissioners, Bonners Ferry, ID
Boundary County Land Use Committees, Bonners Ferry, ID
Kootenai County Board Of Commissioners, Coeur d' Alene, ID
Kootenai County Emergency Services, Coeur d'Alene, ID
Pend Oreille County Commissioners, Newport, WA
Fire Protection District No. 6 Pend Oreille Co., Newport, WA

Businesses and Organizations

Abram Logging, Athol, ID
Allegheny Defense Project, Clarion, PA,
Alliance For The Wild Rockies, Missoula, MT
American Lands Alliance, Washington, DC,
American Wildlands, Sandpoint, ID
Associated Logging Contractors Inc., Coeur d'Alene, ID
Avista Corporation, Spokane, WA
Bead Lake Clean Water Association, Spokane, WA
Blue Mountain Leasing, Usk, WA
Bonner County Groomers Assoc., Nordman, ID
Bonners Ferry Forest Watch, Priest River, ID
Boundary Backpackers, Bonners Ferry, ID
Bronkhorst Co., Elk, WA
CDA Snowmobile Club, Coeur d'Alene , ID
Centers For Water And Wildland Resources, Davis, CA,
Coldwell Banker, Boise, ID
Columbia Forestry, Coeur d' Alene, ID
Columbia Helicopters, Portland, OR
Cove Mallard Coalition, Moscow, ID
Crown Pacific, L.P, St Maries, ID
David Evans & Associates Inc, Bellevue, WA
Defenders Of Wildlife, Washington, DC,
Douglas Constructions & Custom Cutting, Priest River, ID
Environmental Reclamation Inc., Coeur d'Alene, ID
Forest Guardians, Santa Fe, NM,
Forest Watch Program, Spokane, WA
Four Seasons Forestry, Newport, WA
Frank Brothers Logging, Smelterville, ID
Friends Of The Clearwater, Moscow, ID
Friends Of The West , Clayton, ID
GTE Northwest, Sandpoint, ID
Hidden Creek Ranch, Harrison, ID
Hills Resort, Priest River, ID
Horizon Helicopters, LaClede, ID
Idaho Conservation League, Moscow, ID
Idaho Forest Industries, Inc., Coeur d'Alene, ID
Idaho Forest Owners Association, Coeur d'Alene, ID
Idaho Forest Products Commission, Boise, ID
Idaho Sporting Congress, Boise, ID
Idaho Women In Timber, Bonners Ferry, ID
Institute For Policy Research, Evanston, IL,
Intermountain Forest Industry Assoc., Coeur d'Alene, ID
Jepson Logging Inc., Priest River, ID
John Muir Project, Pasadena, CA,
KEA & Audubon Society, Coeur d'Alene, ID
Kettle Range Conservation Group, Republic, WA
KPND Radio, Sandpoint, ID
Kraft Tree Farms, Newport, WA
Leavenworth Audubon Adopt-A-Forest, Peshastin, WA
Louisiana Pacific Corp., Moyie Springs, ID
Maxmar Consulting, Huson, MT
McDonald Logging Co., Priest River, ID
McFarland Cascade, Sandpoint, ID
Murphy Lake Property Inc., Spokane, WA
National Audubon Society, Coeur d' Alene , ID
National Forest Protection Alliance, Bloomington, IN
Native Forest Network, Spokane, WA
Nelson Trucking, Priest River, ID
Newport Equipment Enterprises, Newport, WA
North Idaho Fly Casters, Coeur d'Alene, ID
Northern Lights, Sandpoint, ID
Northwest Forestry Association, Olympia, WA
Outlet Bay Water & Sewer Dist, Priest River, ID
Pend Oreille Environmental Team, Newport, WA
Pendleton Trust, Corona Del Mar, CA,
Pine Ridge Forest Foundation, Coeur d' Alene, ID
Platts Family Trust, Priest River, ID
Ponderay Newsprint Company, Usk, WA
Priest Lake Marina, Priest River, ID
Priest Lake Planning, Coeur d'Alene, ID
Public Land Users Coalition, Kettle Falls , WA
Quality Veneer And Lumber, Inc., Omak, WA
Regulus Stud Mills, Inc., St Maries, ID
Riley Creek Lumber Co., LaClede, ID
Sandpoint Chamber Of Commerce, Sandpoint, ID
Selkirk Priest Basin Assoc., Priest River, ID
Shoshone County Commissioners, Wallace, ID
Sierra Club Palouse Group, Moscow, ID
Simeone Attorney At Law, Colville, WA
Spokane Mountaineers Inc., Spokane, WA

Spokane Winter Knights, Newport, WA
Spokesman Review, Coeur d'Alene, ID
Stimson Lumber Co., Newport, WA
Stump Creek Tree Farm, Hayden Lake, ID
Superior Helicopter LLC., Glendale, OR
The Ecology Center, Missoula, MT
The Lands Council, Spokane, WA
Three Rivers Timber Inc., Kamiah, ID
Three Waters Association, Priest River, ID
Trout Unlimited, Sandpoint, ID
Upper Columbia Group Sierra Club, Spokane, WA
Utah Environmental Congress, Salt Lake City, UT,
Vaagen Bros Lumber Inc., Colville, WA
Weingart Logging Inc., Cataldo, ID
West Priest Lake Fire District, Priest River, ID
Western Fire Ecology Center, Eugene, OR
Western Montana Clinic, Missoula, MT
Western Montana Mycological Assoc., Missoula, MT
Western Pleasure, Spokane, WA
Weyerhauser, Coeur d'Alene, ID
Wilderness Society, Boise, ID
Winter Knights Snomobile Club, Chatteroy, WA

Individuals

Abney, James, Coeur d' Alene, ID
Abney, Linda , Coeur d' Alene, ID
Abrams, Gene, Hayden Lake, ID
Ackerman, Laura & Larry Hampson, Spokane, WA
Adams, Monika, Moscow, ID
Alberts, Richard, Wilsonville, OR
Alford, Jeff, Santa Cruz, CA
Anderl, George, Coeur d'Alene, ID
Anselmo, Charles, Sandpoint, ID
Armfield, Reginald, Nordman, ID
Arnett, Randy, Redmond, OR
Ashwood, John, Spokane, WA
Austin, Jo, Hayden, ID
Avery, Jerald, Pinehurst, ID
Bair, Dale, Ponderay, ID
Ball, Helen, Spokane, WA
Batchelder, Howard, Hayden, ID
Batey, Harry & Kate, Nordman, ID
Baum, Edna & Glenn, Hayden, ID
Beare, Mike, Cataldo, ID
Bellis, Jim, Spokane, WA
Bendickson, Sam, Priest River, ID
Bendickson, Tim And Susan, Priest River, ID
Benedetti, Rob, Spokane, WA
Benefer, Henry, Chattaroy, WA
Benner, Robert & Sharon, Spokane, WA
Bentley, John, Post Falls, ID
Bernhardt, Linda, Athol, ID
Berry, James, Spokane, WA
Berry, John, Newberg, OR
Besser, Thomas, Moscow, ID
Bettesworth, Heather, Denver, CO
Beukema, Phillip & Charla, Marquette, MI
Bignall Jr., Bliss, Coeur d'Alene, ID
Bingham, Jim, Spokane, WA
Birdsell, Kristina, Spokane, WA
Bishop, David, Vancouver, WA
Bligh, Raymond, Veradale, WA
Bosworth, Robert, Bonners Ferry, ID
Bowen, Betsy, Coeur d'Alene, ID
Boyd, William, Coeur d'Alene, ID
Boyd, Michael, Mercer Island, WA
Bradburn, Steve, Spokane, WA
Bradbury, Robert & Karen, Priest River, ID
Bradbury, Gregory & Janett, Priest River, ID
Bradbury, Douglas, Priest Lake, ID
Bradbury, Steven & Sandra, Priest Lake, ID
Brann, Ken, Otis Orchards, WA
Branstetter, Mike, Wallace, ID
Bratton, Marybeth, Vista, CA
Brockmeyer, B, Hayden Lake, ID
Brodin, Jesse, Coeur d'Alene, ID
Brooks, Donald, Spokane, WA
Brown, Allender, Spokane, WA
Brown, Larry, Cusick, WA
Bryan, James, Mead, WA
Buck, Ted, Sandpoint, ID
Buehler, Randy & Denette, Spokane, WA
Burger, Barry, Bonners Ferry, ID
Burkhart, Randal, Aurora, OR
Burns, G.N., Coeur d'Alene, ID
Cadagan, Pat & Gina, Spokane, WA
Cadwallader, Margaret, Spokane , WA
Cah, Coeur d'Alene, ID
Calhoun, W.M., Silverton, ID
Campbell, Scott, Oldtown, ID
Campbell, Stewart, Coeur d' Alene, ID
Cantrell, Harmon, Newport, WA
Cardin, Karen, Sisters, OR
Carpenter, Karen, Portland, OR
Chatfield, Ray, Cataldo, ID
Chernick, Barry, Bellevue, WA
Chinn, Brad, Spokane, WA
Chrysler, Dolores, Spangle, WA
Clark, Chester , Anaheim, CA
Clark, Kevin, Old Town, ID
Clizer, Wayne, Sandpoint, ID
Clizer, Cleo, Spokane, WA
Cobb, Fields, Sagle, ID
Cocks, Jean, Spokane, WA
Coffield, Bates, Priest River, ID

Coffield, Gary, Newport, WA
Cole, David, Veradale, WA
Collier, Mark, Boulder, CO
Compton, Mark, Rathdrum, ID
Connellan, Joseph, Veradale, WA
Connolly, Jeff, Priest River, ID
Connolly, Robert & Rosalie, Laughlin, NV
Cooperstein, Jim & Janice, Spokane, WA
Corbin, Jack, Spokane, WA
Correll, Mindy, Portland, OR
Costigan, R., Spirit Lake, ID
Coughran, Edward, Kailua, HI
Cramer, Robert, Priest River, ID
Craviotto, Harry, Athol, ID
Crenshaw, William, Hayden, ID
Cress, Keith, St Maries, ID
Crimmins, Tom, Coeur d'Alene, ID
Cronin, Jim, Airway Heights, WA
Crow, Thomas & Marlene, Colbert, WA
Curran, Bob, St. George, UT
D'Antoni, Kitty, Hayden Lake, ID
Dalsaso, Julie, Coeur d'Alene, ID
Dalton, Bobbi, Coeur d'Alene, ID
Daugherty, Marc & Peggy, Cataldo, ID
Daugherty, Howard W, Kamiah, ID
Davidson, Barry & Alice, Spokane, WA
Davis, Robert, Camano Island, WA
Davis, Chase , Spokane, WA
Deerwester, Jim, Newport, WA
Dempsey, Dermot, Hayden Lake, ID
Desserault, Kenneth & Dolores, Yakima, WA
Dickerson, Burton & Deborah, Waitsburg, WA
Diedrich, Becky, Sandpoint, ID
Dillon, George, Rathdrum, ID
Dinger, Marilyn, Kaysville, UT
Dingman, Merry Ruth, Coeur d'Alene, ID
Dinnison, Joe, Spokane, WA
Dixon, Ruth, Spokane, WA
Dobbs, Wesley, Twin Falls, ID
Dompier, Mr & Mrs J.K., Spokane, WA
Donovan, Martha, Sheffield, MA
Drennan, L., Coeur d' Alene, ID
Drew, Rene Russell, Newport, WA
Driskill, Linda, John Day, OR
Duenwald, Clement & Ruth, Newport, WA
Dukich, Tom, Spokane, WA
Duncan, Karl & Marylou, Priest River, ID
Early, Donald, Cheney, WA
Ebel, Fred, Colbert, WA
Egolf, Bill & Barbara, Priest River, ID
Eichler, Peter, Sparks, NV
Elliott, Robert & Janet, Priest River, ID
Ellis, Lavon & Celia Ruth, Priest River, ID
Elmendorf, Bernard, Veradale, WA
Emch, M.D., A. Willard, Denver, CO
Eric Eldenberg & Randy Hoisington, Newport, WA
Etter, Patsy, Spokane, WA
Ettinger, Steve, St Maries, ID
Evans, Roger, Sagle, ID
Ewers, Wesley, Cataldo, ID
Feldman, Gabrielle, Moscow, ID
Ferguson, Don, Silverton, ID
Ferri, Dianne Loy, Spokane, WA
Fisher, G.G., Nordman, ID
Flesher, Doloris, Priest River, ID
Forgey, Lyle, Spokane, WA
Forsman, Earl, Spokane, WA
Fossum, Andy, Coeur d'Alene, ID
Fox, Joe, McCall, ID
Frase, Marianne & Ronald, Spokane, WA
Gabrielson, Stieg, Hayden Lake, ID
Gabullen, David, St. Maries, ID
Gagner, Robert, Rathdrum, ID
Gaul, Nolan, Post Falls, ID
Geaudreau, Pat, Deer Park, WA
George, Archie, Moscow, ID
Gerlitz, Tim & Sherri, Hayden, ID
Germain, Robin, Potlatch, ID
Giddings, Ronald, Sandpoint, ID
Gilbody, Dianne, Hayden Lake, ID
Gillette, Amy, Coeur d'Alene, ID
Godwin, Greg, Pinehurst, ID
Gomes, Pam, Hayden Lake, ID
Goodson, Paul, Cataldo, ID
Greer, Kim, Spokane, WA
Gregory, Roger, Priest River, ID
Griessmann, Peter, Colville, WA
Grubb, Peter, Coeur d'Alene, ID
Guir, Stan, Priest River, ID
Guthrie, Richard, Spokane, WA
Guthrie, Kevin, Spokane, WA
Hagler, Steve, Coeur d'Alene, ID
Hagman, Ken, Nordman, ID
Hagman, Gary, Nordman, ID
Hall, David Moscow, ID
Hammarlund, Roy, Seattle, WA
Hancock, Dave, Springfield, OR
Hanlin, Roger, Coeur d'Alene, ID
Hannon, B., Post Falls, ID
Harbuck, Edith, Sandpoint, ID
Harbuck, John, Sandpoint, ID
Hare, Larry & Allison, Priest River, ID
Hawley, Mick, Coeur d'Alene, ID
Heavens, Vera, Duvall, WA
Hedge, Jeff, Spokane, WA
Heibert, Gary, Priest River, ID

Hensley, George, Dalton Gardens, ID
Hess, Art, Spokane, WA
Hewit, Jessica, Rohnert Park, CA
Higgins, Rod, Spokane, WA
Higinbotham, Alan & Annette, Albany, OR
Hilding, Ray, Coeur d'Alene, ID
Hill, David, St Maries, ID
Hillman, Shauna, Silverton, ID
Hindley, John, Spokane, WA
Hines, Jim & Jean, Newport, WA
Hinnen, Christie, Spokane, WA
Hodgson, Mike, Athol, ID
Hoener, Harry & Rhonda, Elk, WA
Holmes, Thomas & Colleen, Post Falls, ID
Holt, Don & Gloria , Nordman, ID
Hoodlly, Gary, Troy, MT
Houff, Patty, Spokane, WA
House, Gerry, Hayden Lake, ID
Howze, S. S., Sagle, ID
Hrabak, James, Kamiah, ID
Huddleston, Ralph & Rita, Marysville, WA
Hughes, Phil, Culdesac, ID
Hunt, David Coeur d'Alene, ID
Hunt, John P, Pullman, WA
Insley, Charles, Jamesville, CA
Isserlis, Kenneth, Spokane, WA
Jacobson, Bert, Spokane, WA
Janoski, Bernard, Coeur d'Alene, ID
Jayne, Douglas, Spokane, WA
Jensen, Joe, Spokane, WA
Jepson, Delbert, Priest River, ID
Jeremossier, Dr, Hayden Lake, ID
Jimeskerse, A, Worly, ID
Johnson, Raymond, Sunnyside, WA
Johnson, Barbi, Priest River, ID
Johnson, Charlie, Coeur d'Alene, ID
Johnson, Ron, Post Falls, ID
Johnson, John, Post Falls, ID
Jokela, Brian & Mary, Deer Park, WA
Jones, Doug, Houghton, MI
Jones, David Kooskia, ID
Jones, Richard, Coeur d' Alene, ID
K, William, Tigard, OR
Kang, Mun-Sik, Wilsonville, OR
Keeton, William, Usk, WA
Keller, Barry, Idaho Falls, ID
Kelley, Lawrence, Sandpoint, ID
Keup, Eldon, Puyallup, WA
Kienke, Richard, Hayden, ID
Kienke, Verton, Post Falls, ID
Kipp, Henry & Elaine, Olympia, WA
Klatt, Eileen, Hope, ID
Klein, Rodney, Newport, WA
Kluver, Steve, Sandpoint, ID
Knapp, Kenneth, Spokane, WA
Knoles, Ed, Priest River, ID
Knoles, Kenneth, Priest River, ID
Knuth, Ruth & Charles, Deer Park, WA
Kovatch, Patricia, Dalton Gardens, ID
Kriss, Victor, Asotin, WA
Kroese, Rob, Coeur d' Alene, ID
Krys, Ernie, Kellogg, ID
Kubik, Stan, Hayden Lake, ID
Kuhlman, Norm, Post Falls, ID
Kuhlman, Ron, Coeur d'Alene, ID
Kuhn, Lisa, Ashland, OR
Kuttner, David, Spokane, WA
Lacy, Thomas, Harbor Springs, MI
Lan, Ho, Spokane , WA
Landa, Carlos, Spokane, WA
Lansden, Roger, Tigard, OR
Larsen, Carl, Spokane, WA
Latemdresse, Samuel & Dorothy, Spokane, WA
Laufer, Laura, Spokane, WA
Laurl, J, Sandpoint, ID
Law, Warren, St Maries, ID
Lawrence, Marc, Potlatch, ID
Legg, Robert, Coeur d'Alene, ID
Lehinger, Mark, Spokane, WA
Leonard, Albert, Farmington, WA
Lightner, Marvin, Cataldo, ID
Lill, Nancy, Spokane, WA
Longmeier, Mark & Jill, Spokane, WA
Lukens, William, Sandpoint, ID
Luppert, N, Spokane, WA
Lynne, Nancy, Coeur d'Alene, ID
Maciosek, Ralph, Coeur d'Alene, ID
Madsen, Peter L & Susan, Priest River, ID
Mahar, Christine, Coeur d'Alene, ID
Malbon, Michael & Donna, Long Beach, CA
Maple, Dan, Cocolalla, ID
Marie, Ruth, Lubbock, TX
Martin, Scott & Libby, Spokane, WA
Martin, Dennis, Seattle, WA
May, Harvey, Sagle, ID
Mayes, Teresa & Eric, Coeur d'Alene, ID
McClure, Timothy, Glen Ellen, CA
McBride, Jerry, Spokane, WA
McDirmid, James K & Christine, Spokane, WA
McDonough, Tom, Priest River, ID
McEwan, Chad, Post Falls, ID
McGee, Lloyd, Colville, WA
McGillivray, Kevin, Kingston, ID
McGillivray, Madelyn & Duncan, Kingston, ID
McGovern-Rowen, Matt, Missoula, MT
McInerney, Brian, Spokane, WA

Meents, Karl & Cheri, Des Moines, WA
Meier, Samuel, Portland, OR
Mendenhall, David Bonners Ferry, ID
Meyers, Dan, Kamiah, ID
Miller, K., Sagle, ID
Miller, Samuel, Cusick, WA
Miller, Dan, Priest River, ID
Miller, Marlene, Spokane, WA
Miller, Samuel, Cusick, WA
Miller, Trudy & Randy Greyerbiehll, Spokane, WA
Mischenke, Ladimer, Priest River, ID
Mitchell, Roy, Sagle, ID
Montee, John, Hayden, ID
Moody II, William, Sandpoint, ID
Moore, Art, Nordman, ID
More, Leslie & Gary, Republic, WA
Moreland, Charles, Hayden, ID
Morrison, Mark, Portland, OR
Morrow, Angie, Harrison, ID
Moseley, Robin, Coeur d'Alene, ID
Muhm, Daniel, Spokane, WA
Muhm, J. Michael, Woodinville, WA
Murphy, Michael & Carolyn, Hayden Lake, ID
Murphy-Binder, Mary Cay, Bellevue, WA
Myers, Ron, Spokane, WA
Myers, C.A., Spokane, WA
Nail, Rickey, Holly Pond, AL
Nail, David, Spokane, WA
Neal, Eugene & Norma, Falls City, OR
Nessly, James, Spokane, WA
Nevins, Teresa, Spokane, WA
Newcombe, Ray & Sally, Coeur d'Alene, ID
Niswander, Ruth, Davis, CA
Niven, Kurt, Spokane, WA
Noble, David Spokane, WA
Nolen, Jim, Coolin, ID
Nolte, Christopher, Kellogg, ID
Nolze, Mark, Priest River, ID
Norlander, Jason, Spirit Lake, ID
Noyes, Ralph, Hayden, ID
O'Halloran, III, Mr & Mrs J.E., Spokane, WA
O'Brien, John, Coeur d'Alene, ID
O'Linger, Libby, Hayden Lake, ID
Oare, Olivia Ann, Coeur d'Alene, ID
Odenberg, Richard, Hayden Lake, ID
Oglesbee, Thomas, Cusick, WA
Olsen, Jim & Barbara Hope, ID
Omodt, Fred, Sandpoint, ID
Osborn, A.C. Ozzie, Coeur d'Alene, ID
Oswald, Cindy, Hayden, ID
Ownbey, Forrest, Newport, WA
Parker, Bob, Lapine, OR
Parr, Candace, Colville, , WA
Parsons, Frank, Priest River, ID
Parsons, William, Spirit Lake, ID
Patton, Ms. F.A., Washington, DC
Pavia, Jerry, Bonners Ferry, ID
Payne, Margaret, Coeur d'Alene, ID
Peak, Joe, Kingston, ID
Pelton, Tim, Spokane, WA
Pence, Don, Coeur d'Alene, ID
Pentas, Donald, Spokane, WA
Peterson, Eugene, Priest River, ID
Peterson, Larry, Republic, WA
Pettit, Donald & June, Oldtown, ID
Pettit, Don, Post Falls, ID
Pfeifer, Patrick, Spokane, WA
Pflugard, Barbara, Hayden Lake, ID
Phillips, P.A., Cameron, Coeur d'Alene, ID
Pickering, Michael, Spokane, WA
Pickett, Mollianne & George, Olympia, WA
Plaster, Leonard, Sagle, ID
Pluid, Mike, Bonners Ferry, ID
Pool, Juanita, Hayden, ID
Port, Alan, Usk, WA
Porter, G.S., Tonasket, WA
Porter, Edward, Sagle, ID
Quinn, Jack, Spokane, WA
Raccaro, Charles, Coeur d'Alene, ID
Raine, Austin & Gayle, Priest River, ID
Rawlinson, Ken, Coolin, ID
Ream, Lorna, Spokane, WA
Reese, Benjamin, Sagle, ID
Reeve, Gary, Spokane, WA
Renner, Harvey, Cataldo, ID
Reynolds, W.C., Murray, ID
Reynolds, Michael & Catherine, Priest River, ID
Reynolds, Jeff, Priest River, ID
Rhodes, Orville, Spokane, WA
Richardson, Paul, Newport, WA
Moore, Sandra & Rick, Colville, ,WA
Riggles, R. Elfstrom, Mount Vernon, WA
Roady, Chuck, Bonners Ferry, ID
Robinson, Ed, Coolin, ID
Robinson, Laurene, Post Falls, ID
Rogers, C.M., Hayden, ID
Rosenberg, Barry, Priest River, ID
Rosenlund, Anders, Kingston, ID
Roth, Steve, Kingston, ID
Rupert, Greg, Spokane, WA
Russell, Susan, Spokane, WA
Ryan, Robert, Aurora, OR
Ryan, Richard, Spokane, WA
Saari, Dawn, Spokane, WA
Sager Jr, James, Spokane, WA
Sams, Rocky, Kamiah, ID

Sandstrom, Ron, Spokane, WA
Scarborough, James, Bainbridge Island WA
Schierbaum-Seely, Judith, Spokane, WA
Schiermeister, Daniel, St Maries, ID
Schnitzer, R.T., Moscow, ID
Schultz, Ed, Colville, WA
Sedler, Liz, Sandpoint, ID
Shelton, Robert, Spokane, WA
Shepard, Nathan, Coeur d'Alene, ID
Shill, Dave & Karen, Spokane, WA
Shirey, Crystal, Priest River, ID
Shutts, Richard, Rathdrum, ID
Simchuk, M.S., Janice, Spokane, WA
Sims, Sandra, Dalton Gardens, ID
Sisson, Larry, Seattle, WA
Skipworth, C.B., Auburn, WA
Smith, Serena, Spokane, WA
Smith, Nancy, Avon, CO
Smith, Greg, Oregon City, OR
Smith, Edie, Osburn, ID
Smith, Stan, Coeur d'Alene, ID
Smith, L. Joe, Priest River, ID
Smith, Doug, Newport, WA
Smythe, Faye, Cataldo, ID
Snodgress, Ray, West Richland, WA
Snyder, Robert, Nine Mile Falls, WA
Soumas, Rob, Coeur d'Alene, ID
Spalding, Diane, Spokane, WA
Spedden, Steven, Lewiston, ID
Spilker, Mr. & Mrs. William, Spokane, WA
Spilker, Mary, Seattle, WA
Steckmest, Erik, Tualatin, OR
Stevens, Elaine, Spokane, WA
Stevens, John, Kootenai, ID
Stevens, Ken, Sandpoint, ID
Stewart, Dustin, Rathdrum, ID
Stockton, John, Salt Lake City, UT
Stout, Mrs. Jean, Boise, ID
Strand Jr, William F., Seatac, WA
Strode, Don, Coeur d'Alene, ID
Stutzman, Cheryl, Spokane, WA
Styer, William & Rita, Moscow, ID
Styskel, Edward, Bend, OR
Sverdsten, Mark, Cataldo, ID
Sweeney, Jenny, Spokane, WA
Swendig, Joe, Hayden, ID
Tenney, Lloyd H. & Vivian Priest River, ID
Teren, Dorothy, Coeur d'Alene, ID
Theodore, Darnell & Carole Tilden, Priest River, ID
Thomas, Bill, Portland, OR
Thompson, Carroll, Sandpoint, ID
Thompson, Ron & Tami, Coeur d'Alene, ID
Throop, Clayton, Colville, WA
Toutonghi, Mary, Fair Oaks, Ca,
Trail, Donald, Spokane, WA
Trottman, Ken, Veradale, WA
True, Todd, Seattle, WA
Tucker, Scott, Newport, WA
Turcke, Paul, Boise, ID
Turnbull, Roy & Arlene, Priest River, ID
Ulrich, Roberta, Beaverton, OR
Uttech, Alton, Dayton, NV
Van Asche, Tom, Pinehurst, ID
Van Kuiken, Jay, Wallace, ID
Van Patter, Rogalski or Mary, Veradale, WA
Vaughn, Patron, Harrison, ID
Venturino, Tony & Jeanne, Hayden, ID
Vierra, Aaron, Sagle, ID
Vogel, Elmer F. & Fredrick E, Usk, WA
Vredenburg, Chuck, Coeur d'Alene, ID
Waisanen, Pete, Post Falls, ID
Waldrup, Jon, Sandpoint, ID
Walen, Tommy, Kettle Falls, WA
Walker, Kevin, Pinehurst, ID
Ward, Betsy, Spokane, WA
Wardrop, Mitch, Priest River, ID
Warner, Barbara, Lebanon, KY
Warnstadt, Paul & Jean, Newport, WA
Watson, David Post Falls, ID
Weatherly, Dick, Hayden Lake, ID
Weber, Jim, Coeur d'Alene, ID
Weiherer, Frank & Eileen, Hayden, ID
Weingart, Byron, Cataldo, ID
Weinstein, David, Hayden, ID
Wells, George, Post Falls, ID
West, Mike, Harrison, ID
Westervelt, Susan, Deary, ID
Westra, John & Barbara Priest River, ID
Wheeler, Ralph, Post Falls, ID
White, Robert & Naomi, Spokane, WA
White, Tara, Spokane, WA
White, Leroy, Yamhill, OR
Widgren, Bart, Athol, ID
Wiedemann Phd, Frederic, Sagle, ID
Wielgos, Tom & Vicki, Renton, WA
Williams, Dell, Moss Beach, Ca,
Williams, Byron, Usk, WA
Williams, W., Coeur d' Alene, ID
Williamson, Maurice, Colville, WA
Wills, James, Pullman, WA
Wilson, Ernie, Lewiston, ID
Wing, Robert, Lewiston, ID
Winterow, Brett, Colville, WA
Wintod, James, Wallace, ID
Wise, Ron & Mimsi, Lewiston, ID
Wolcott, Mike, Sandpoint, ID

Wolf, Robert, St. Leonard, MD
Wood, Dennis, Dalton Gardens, ID
Wylie, Anthony, Fowlerton, TX
Yandt, RW & Jane, Spokane, WA
Yarber, Dale, St Maries, ID
Yarborough, Ben, Washougal, WA
Yep, Ronald & Marcia Spokane, WA
Yergler, Gary, Pinehurst, ID
Yochum, Tom, Chattaroy, WA
Young, Melissa, Chattaroy, WA
Young, Clay, Hayden, ID
Zaccheo, Ronald, Usk, WA
Zahn, Armin, Coeur d'Alene, ID